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GEOLOGICAL REPORTS.

(CONTINUED.)

In our last we gave the report as far as the survey has extended, on this important and interesting subject, for the State of New York; we now procced, and shall go through the different states in succession as quickly and faithfully as the matter and the actual progress will permit.

MAINE.

The Geological Survey of the State of Maine, is in charge of *Dr. Charles T. Jackson*, of Boston.

The first report was published in 1837; it contains one hundred and twenty seven pages, and treats of Topographical and Economical Geology, accompanied by an atlas of twenty-four plates, with many wood cuts in the body of the report.

The second report was made in 1838, containing one hundred and sixty-eight pages. Under the heads of Topographical, Economical, and Agricultural Geology, we have an interesting and valuable account of the granite, limestone, roofing slate, and iron ores, of Maine. Analyses are given of soils, and other matters of importance to agriculture, illustrated by numerous engravings on wood.

The third annual report was published in 1839. It contains two hundred and seventy-six pages, and is illustrated by numerous wood cuts. Divided into General Geology, and Agri-

cultural Geology. It is a well written report, containing much useful information upon limestones, roofing slates, analyses of soils, &c. followed by a catalogue of the specimens collected.

MASSACHUSETTS.

The Geological Survey of this State was performed by *Professor Edward Hitchcock*, during the years 1830–31. The full report was published by the state in 1833, and is entitled, "Report on the Geology, Mineralogy, Botany, and Zoology of Massachusetts." This report, which is of seven hundred pages, with an atlas of plates, presents a full account of the various rocks and minerals of the state, with much information of an useful and practical nature, and a catalogue of the same; followed by a list of the plants of Massachusetts, and also lists of the various subjects of the zoological department, viz: birds, reptiles, fishes, shells, crustacea, spiders, insects. This is a valuable report, in consequence of the many useful and interesting facts it contains; it reflects honor upon the state which authorized it, and upon the individual to whom it was given in charge.

The legislature of Massachusetts subsequently ordered a a re-survey of the state, which was also performed by *Professor Hitchcock*. We have not read this second report; but there is a notice of it by *Professor C. U. Shepard, in vol.* 36 *of Silliman's Journal, for July*, 1839. It is said to contain much valuable information upon soils, manures, and other matters relating to agriculture, and is referred to as a valuable work.

An agricultural survey of Massachusetts was also ordered by the legislature, and is now in progress. The first report, of one hundred and thirty-nine pages, was made in 1838, by *Henry Colman.*

Massachusetts was the first state in the union which performed a complete geological, botanical, and zoological survey. North Carolina, as early as 1824 had ordered a geological survey.

CONNECTICUT.

The geological survey of Connecticut was given in charge to *Profssor C. U. Shepard* and *Dr. Percival.* In 1837, Professor Shepard presented a report upon the economical mineral re-

sources, and scientific mineralogy of the state. The first part of this report contains much useful information upon iron ores, limestones, building materials, and other rocks which occur in this state; the latter part of the report is considered by Professor Silliman to be too scientific. *See notice of this report in Silliman's Journal, vol.* 23, *No.* 1, *for October* 1837. The geological report from Dr. Percival we have not seen, and are not aware that it has been published.

NEW JERSEY.

The geological survey of this state was made by *Professor Henry D. Rogers*, of Philadelphia, during the years 1835–36–37. The first report was made to the legislature in February 1836, and contains one hundred and eighty-eight pages, and several sections. This report gives a full account of the marl region of New Jersey, and of other valuable and useful minerals, especially limestones, and ores of iron, zinc, and copper. The survey was continued and completed in 1838, but we have not seen the final report.

PENNSYLVANIA.

The geological survey of Pennsylvania, has been conducted by *Professor Henry D. Rogers*, of Philadelphia, who has made three reports to the legislature.

The first report, which was made in December 1836, consists of twenty-two pages, and is of a preliminary nature.

The second report was made in February 1838, and contains ninety-three pages. It affords a description of the rocks of Pennsylvania, with a tabular arrangement of the same. The rocks are not named, but numbered, beginning with the lowest fossiliferous or sedimentary rock, which is a sandstone, and is called No. I. No. II is a limestone, and is the same as the "Trenton limestone," of the New-York geologists. The anthracite coal districts are described as No. XIII. The rocks of Pennsylvania as high as Nos. VIII and IX, are identical with, and doubtless in most instances a continuation of the rocks in the southern and western counties of New-York.

The third report was made in February, 1839. It contains one hundred and nineteen pages, and treats chiefly of the exten-

sive coal fields of Pennsylvania. Professor Rogers has decided that the bituminous coal and anthracite of Pennsylvania both occur in the same rocks, or in rocks of the same age. For the purposes of this survey, the state is divided into six geological districts, and Professor Rogers has nine geological and two chemical assistants. Pennsylvania is rich in coal, iron, salt, and marble.

MARYLAND.

We have seen but one report from this state, entitled "Report on the New Map of Maryland, 1836." This pamphlet, of one hundred and four pages, contains a report by the geologist *T. J. Ducatel*, upon the geology of some of the counties of the marl region, and also upon the coal region of the state, especially near Frostburg. This coal field is described as covering an area of two hundred square miles. The report is accompanied by four maps and sections.

A report from the engineer, *J. H. Alexander*, referring to canals and roads, with a map, concludes the pamphlet. It refers to several preceding reports, and we understand that the survey is still in progress.

VIRGINIA.

The geological survey of Virginia is conducted by *Professor William B. Rogers*, of the University of Virginia.

The first report, of thirty pages, was made in January 1837; it treats generally of the marl region near the coast, of the gold belt and other rocks east of the Blue Ridge, and of the limestone, plaster, salt springs, &c. west of the Ridge.

The second report, of fifty-seven pages, was made in February 1838. It contains farther remarks upon the marl region, and describes the rocks west of the Blue Ridge, which are numbered to correspond with those of Pennsylvania, from I to XII. Limestones, both common and hydraulic, iron ores, salt, and plaster, occur in these rocks.

The third geological report was made April 2d, 1839. It forms legislative document No. 56, and contains thirty-two pages. This report describes the Appalachian region, which consists of slates, limestones, and sandstones, and is rich in

iron ores; also the valley of Virginia, which consists chiefly of limestone, and contains the natural bridge, and Weyer's cave, two celebrated wonders of nature. Likewise, a description of some of the Virginia coal fields, and analyses of limestones and iron ores.

The reports upon Virginia, are written in a pleasing style, and convey much interesting information respecting the mineral resources of the state. Virginia is rich in iron, salt, plaster, and coal.

NORTH CAROLINA.

The geological survey of North Carolina, was made by *Professor Denison Olmstead*, in 1824–25, by authority of the state. This is the first survey of the kind that was made in the United States. The report is published in *Silliman's Journal, vol.* 14, 1828.

Professor Elisha Mitchill made a geological examination of the gold region of North Carolina, the report of which is also contained in *Silliman's Journal, vol.* 16, 1829.

TENNESSEE.

The geological survey of Tennessee is in the charge of *Professor G. Troost*, of Nashville.

We have seen only the fourth report of Dr. Troost, Oct. 1837, in thirty-seven pages. It contains a short general treatise on geology, and an examination of the Ocoee district, with a map, and a list of fossils.

KENTUCKY.

In 1837, *Professor W. W. Mather* was appointed, and made a geological reconnoissance of this state. We believe that nothing further has been done.

OHIO.

The geological survey of Ohio has been conducted under the superintendence of *Professor W. W. Mather*.

The first annual reports were made to the legislature, January 17th, 1838, and contain one hundred and thirty-four pages. The several papers were as follows:

Report from *W. W. Mather*, principal geologist, upon general and economical geology.

Report of *Dr. S. P. Hildreth*, first assistant geologist and Palæontologist, upon some members of the coal series, and upon salines.

Report of *Dr. J. P. Kirtland*, second assistant geologist, upon zoology and botany.

Report of *Professor C. Briggs, Jr.* fourth geological assistant, upon the geology of the district between the waters of Scioto and Hockhocking rivers, especially limestones, coal, and iron ores.

Report of *Col. Charles Whittlesey*, topographer to the survey, upon topography, with a map and sections.

See a review of the first annual report upon Ohio, in Silliman's Journal, vol. 24, *No.* 2, *for July* 1828.

The second annual reports were made to the legislature in December 1838. They form a large pamphlet of two hundred and eighty-six pages, and contain a very interesting account of the mineral wealth of Ohio. The several papers are as follows:

Report of *W. W. Mather*, principal geologist, upon economical geology, coal, analyses of soils, iron ores, &c.

Report of *C. Whittlesey*, topographer, upon the dip of strata, variation of the needles, tides, &c. with two maps.

Report of *Col. J. W. Foster*, assistant geologist, upon the counties of Muskingum, Licking, and Franklin. He adopts the following arrangement: alluvium, tertiary, coal-measures, fine grained sandstone, shale, carboniferous limestone. With a section.

Report of *C. Briggs, Jr.* assistant geologist, upon the counties of Wood, Crawford, Athens, Hocking, and Tuscarawas. With a section.

Report of *Professor J. P. Kirtland*, assistant geologist, upon zoology, with a tabular view of the mammalia, birds, reptiles, fishes, testacea, and crustacea, of Ohio.

Report of *Professor John Locke*, assistant geologist, upon the south west part of Ohio, with sections, maps, and several plates of fossils.

The geological survey of Ohio, is for the present suspended, the legislature of 1838 not having made any appropriation for its continuance.

INDIANA.

Dr. David Dale Owen, was engaged in 1837, in a geological reconnoissance of this state, and made a report to the legislature, of thirty-four pages. We believe that no farther progress has been made in this matter. The western part of Indiana is said to be rich in coal.

MICHIGAN.

The geological survey of Michigan is in the charge of *Dr. Douglass Houghton*. We have seen his report for 1837. Michigan contains coal, gypsum, and salt springs, which latter, however, appear to be rather weak. We believe the survey of this state is still in progress.

[For the American Repertory.]

MANUFACTURE OF WHITE LEAD,

OR CARBONATE OF LEAD.

The subject is one of great interest, as well in reference to the extensive use of the article as a beautiful and cheap pigment, as to the health of the workmen engaged in the process of making it.

The conversion of the metal is brought about by various methods, differing in different countries or places, according to the fastidious prescriptions of fancy or custom. Nevertheless, by far the greatest proportion of white lead is made by exposing sheets of metallic lead, in earthern pots to the action of the vapor of vinegar, atmospheric air, and carbonic acid gas, produced by the decomposition of an inhumating material in which the pots are imbedded, (usually spent tan, or horse litter.) The pots used are of different sizes, and contain from 2½ to 12lbs. according to the form in which it is exposed, some preferring it in a gridiron form to that of sheets.

The sheets of lead are cast expeditiously on pans of rough sheet iron, about 2½ feet long and 6 inches broad, which, for the purpose of confining the fused metal, are furnished with a rim on both sides, and at the end to which the *handle* is attached. The workman places this *pan* in nearly a horizontal direction, and

with one end resting on the *casting kettle*, a *ladleful* of the fused metal is poured upon it; it is then quickly raised, so as to give the *pan* a declination of 10° or 15° towards the *kettle*. In this way a thin sheet of lead will remain on the *pan*, which is then removed. This operation is repeated three or four times, when the heated *pan* is exchanged for a cold one. A man can readily cast two or three tons of lead in a day. The griddle forms are cast in open moulds placed on a table. The sheets of lead are convoluted so as not to touch, and placed in earthen pots which have been previously supplied with vinegar. These pots are deposited in layers, one over the other, and are confined by boards in a wooden frame, being wholly surrounded and divided between the layers with horse litter or spent tan. The pots when placed are usually first covered with a layer or two of sheet lead and then with boards, so as to keep the litter or tan from the lead. The decomposition of the embedding material soon commences, when carbonic acid and heat are evolved, the vinegar is volatilized, and the lead is converted to a carbonate. The time employed for converting the metal varies from two to four months, according to the season or temperature. Some portions, and not unfrequently one half, of the lead remains unchanged, which is cast over, and re-exposed as above described. A small portion of acetate of lead is formed; this is removed by washing, or decomposed with the carbonate of potash, in the subsequent process of manufacture.

The greatest portion of white lead used is now made in this manner, and, so far as we have any knowledge of the subject, has been, from time immemorial. In England and Holland, no other method has been practised, until quite recently. In France, Germany, and in the United States, other modes of manufacture are practised, and with what success we shall presently show; but, before doing so, we think it proper to notice a few of the many attempts which have been made to modify it, but which have proved abortive.

It appears by the Repertory of Arts, second series, vol. 13, pp. 244, London, that Edward Moore Noble, of Birmingham, England, obtained letters patent on the 23d of January 1808, for making white lead by a new process. We shall use the inven-

tor's own language, as far as we can, in giving a brief account of it. "I take lead, which I prefer to be in thin plates, or small pieces, and place it in a vessel that has a small communication with the atmosphere; to this I add so much acetous acid or vinegar, or a solution of acetate of lead, or of both, that the lead may not be wholly, but only partially covered in the liquor. I then transfer into the vessel a mixture of carbonic acid gas, and oxygen gas, or atmospheric air, or a mixture of all three, and I frequently agitate the mixture in order to make the liquor pass over and act upon the lead, and that the carbonate of lead when formed may be removed from the surface of the metal, and a fresh surface thereof may be exposed. Or, instead of the lead in a metallic state, I take litharge, or an oxide of lead containg the proportions of oxygen that will enable it to unite with the acetic acid; and to this I add either acetous acid, or a solution of acetate of lead, or both, taking care that the quantity of oxide of lead, be at least sufficient to saturate the acid. I then transmit into, through, or upon the mixture, carbonic acid gas, either in a state of purity, or mixed with atmospheric air, with oxygen gas, or with any other gas that will not injure the process, and I find it expedient, frequently to agitate the mixture, to facilitate the union of the carbonic acid gas, with the oxide of lead. Which ever process I make use of, a white substance is precipitated, which is white lead."

On the 26th August, 1808, about seven and a half months after the patent had been granted to Mr. Noble, in England, the French government issued a brevet for five years to M. M. Lescure & Brechez, of Pontois, for making white lead. Their specification is described at length, in the *4th vol. of the Repertory of Arts, p.* 125 *et seq. London*, 1829; but as more brief and intelligible, we quote a description of it from *Gray's " Operative Chemist," second edition- p.* 626, *London.*

" In France a solution of lead is first prepared by adding at least 174 pounds of finely ground litharge to 65 pounds of pyroligneous acid, of such strength that 22½ grains of this acid may saturate 25 grains of well crystalized subcarbonate of soda; fifteen or twenty times as much water is usually added. The whole is left for a short time, and the clear

solution being poured off, some fresh acid and water is poured on the sediment, to take up any oxide that might have escaped the action of the first parcel."

"The clear solution decanted off, the residuum is run into large but shallow covered cisterns, and carbonic acid gas is passed into the liquid contained in these cisterns, by a large number of pipes.

"This carbonic acid gas is procured by the burning of charcoal in a close stove, and passing the burnt air into the liquor. When no more settling appears to be formed, the whole is passed into a deep cistern, and left there for some hours, when the liquid part is poured off, in order to be combined again with more litharge, some fresh acid being also added."

Thus formed, it is to be well washed and dried, when it is the article of commerce, known in France as the "Clichy white lead," from the name of the place where it is chiefly manufactured.

There is no difference in the quality of white lead made by the process of Noble, and that of Lescure & Brechez; they are in fact the same in principle, but differ in detail sufficiently to entitle them to the protection of their respective governments; but the credit of first discovery, if any be due, belongs unquestionably to Noble.

White lead made in this way is, speaking technically, very defective in body, or in other words, it has not the same degree of opacity as that which is made in earthern pots, as before described; three, four, or five coverings of the former being scarcely equal to one of the latter. The cause of this difference has not been determined; but it is highly probable that it is a bi-carbonate, or contains too much carbonic acid to make its use economical. Attempts have been made to manufacture white lead by this process in the United States; but, from the objections above stated, a market could not be found for it, and the manufacture has therefore been abandoned.

In France, the only country in which it is used to any considerable extent, it is understood that its manufacture is patronized by government. It is a beautiful paint, but, mixed with oil, is diaphonous, and hence is not likely to come into general use, except in very delicate paintings.

"The German White Lead" is chiefly manufactured from the lead of Bleyberg in Corinthia, on account of its purity. The lead is cast into sheets as before described. Instead of pots, boxes five feet long, one foot broad, and about ten inches deep are used; the lower part of the boxes is pitched about an inch high; the upper part has sticks placed across. The acid mixture poured into each box is in some manufactories made of a gallon each of vinegar and wine lees; in others of twenty pints of wine lees, eight and a half pints of vinegar, and one pound of pearlash; the vinegar is usually made of crab apples and water. The leaves of blue lead being trimmed to a proper size, are doubled and hung over the sticks in the upper part of the box so as neither to touch each other, the sides of the box, nor the acid liquor; a cover is then put on, and if a dung heat be used, or the mixture contain pearlash, the joints are carefully closed with paper pasted over them. The more usual mode is to dispose the boxes in a large room heated by stoves to about 80° Faht. A greater heat would evaporate the vinegar too fast.

"In about a fortnight the corrosion is finished, and the sheets of white lead are found near one fourth of an inch thick, and covered in some places with crystals of sugar of lead. As much as can be got off by a moderate degree of force is washed off. The washing is esteemed the most delicate part of the whole manufacture; during the progress of it, a white scum appears which is taken off, and a little pearlash being added, it is changed into white lead of a beautiful whiteness, and is sold for choice purposes, by the name of cream of lead.

"The remainder is mixed in different proportions, according to the market for which it is designed, with a pure sulphate of barytes, brought from the Tyrol. White lead manufactured by this process, with the exception of a shade or two of difference in its favor as to whiteness, is possessed of the same qualities, as that made in pots as previously described; but the process is much more expensive, and consequently it is not used to any great extent.

In the *Annales de Chimie*, *vol.* 79, 80, *p.* 326. Paris, it appears that M. M. Clement and Desormes, in Nov. 1811, communica-

ted to the editors of that work a process for manufacturing white lead proposed by Montgolfier. Thenard, in all the editions of his treatise on chemistry up to the 6th, (*see vol. 3d p.* 158, *Paris,* 1834,) also notices the same subject, and as his is more brief and equally explicit, we copy as follows, from him, viz:

"Montgolfier has proposed a new method for making white lead, in which he uses this metal, vinegar, carbonic acid, and air. For this purpose he establishes, by means of a tube, a communication between a furnace of lighted charcoal, and the end of a cask containing a certain quantity of vinegar, and communicating also, by means of a tube from the opposite end of the cask, with a box filled with sheets of lead, cast and not rolled. The carbonic acid proceeding from the combustion of the coal, and mixed with nitrogen and oxygen that has escaped the action of the fire, enters the cask charged with the vapor of vinegar, and thence passes into the box containing the sheets of lead; these are readily attacked, and there results, as in the Dutch process, a mixture of acetate and carbonate of lead, which they separate by washing.

From the fact that M. M. Clement and Desormes, having given publicity to this plan in 1811, and from its not having been since noticed even by Thenard, who resides in Paris, nor in any chemical or scientific work, as having been carried into successful operation, it is probable, that white lead cannot be made by Montgolfier's proposed plan, at least to any profitable extent. Indeed, Professor Steele states, that he had heard of it being done, or attempted, near Glasgow, but had also heard that it had there failed.

The objections to this plan are, first, the impossibility of obtaining a sufficient supply of oxygen through a furnace of burning charcoal; and, second the procurement of a sufficient draft to, and diffusion of the corroding materials through, a case supplied with the sheets of lead, and otherwise arranged as M. M. Clement and Desormes have proposed.

Mr. A. I. Hamilton of the city of New-York, obtained letters patent from the United States, on the 8th November, 1813, for making that form of the carbonate of lead, called white lead.

For this purpose he sank cisterns of any convenient shape

and size, (less than three thousand gallons capacity) to the depth of ten feet, more or less, into the earth, in a molasses distillery, or any other convenient place. These cisterns were furnished with frame work and rods or laths within, for supporting sheets of lead, of any convenient size and thickness, and when so arranged, with the sheets of lead on the rods, vinegar was admitted to the depth of about nine inches on the floors of the cisterns. These cisterns were closed at their tops with strong tight covers, through which access was had by means of folding doors, which closed so tight as to prevent the escape of the vapors from within, "*and also to intercept the communication of atmospheric air*" and light with the cisterns and their contents. The natural heat of the earth was relied on to volatilize or evaporate the vinegar, and when this was insufficient, the deficiency was supplied by adding heat from a neighboring still, or by adding heated vinegar to that contained within the cisterns. The specification of Mr. Hamilton is long, and contains an account of many details, which from our present knowledge of the the manufacture of white lead, are of no consequence; sufficient has been stated to give the reader a knowledge of the leading features of his plan. An insuperable objection to its success is presented, in the exclusion of atmospheric air from the cisterns, which is a positive condition in it. Nor does it contain any provision for a supply of carbonic acid, without which, it is utterly impossible to make white lead. Nor will it be pretended, by the merest tyro in chemical knowledge, at this time, that white lead can be made without a free supply of those agents, viz: oxygen (contained in atmospheric air) and carbonic acid.

Mr. Edward Clark, then of Philadelphia, but now of this city, took letters patent on the 18th March, 1818, for manufacturing white lead. His process consists in triturating together a mixture of common salt, litharge, and water, in saturating quantities, until a chloride of lead be formed; water is then added in excess, the mass kept in motion, and carbonic acid gas passed into it by means of a suitable blowing apparatus, until the caustic soda, which had been set free by the union of the chloric acid of the salt with the protoxide of lead, becomes a carbonate;

when a reciprocal decomposition of the chloride of lead and carbonate of soda takes place, and there remained common salt in solution with water and white lead.

The liquor is next decanted for re-use; the white lead is washed till freed from the salt, dried, and is then ready for market.

The tubs used by Mr. Clark were about five feet in diameter, and two feet deep in the clear. Their bottoms were of marble, and they were lined with sheet lead. When flake litharge was used, the carbonate of lead with the chloride of soda was ground in a run of stones, and subsequently floated. The last operation is not necessary unless the peroxide of lead be present.

White lead made by this process was tried by several painters in the city of Philadelphia, and pronounced equal in quality to any other. An establishment was erected in that city to carry the manufacture of white lead on this plan into operation; but the person who was to furnish the requisite capital failed to do so, and it was applied to some other use.

The process above described is in conformity with strict chemical principles, and cannot fail in producing beneficial results, if applied to convert the litharge to white lead, which is formed by the process of separating silver from lead.

Mr. Jos. Richards took letters patent on 28th May, 1818, for making white lead. His process consisted in reducing small particles of lead, by attrition, one against the other and against the inner side of a leaden cylinder, which was supplied with water and carbonic acid gas, and by means of machinery made to undergo a continuous rotation. From this operation a fine white powder was procured, very much resembling carbonate or white lead, but which, on being mixed with oil, and used, assumed in a short time a yellowish or salmon colored tint, and left the inference that some other material than carbonic acid was present in combination with the metal.

A patent, dated 13th June, 1826, was granted to John Ham, of Bristol, England, for making white lead. *See vol.* 6, *p.* 307, *Repertory of Arts, London,* 1827.

Subsequently one or more patents have issued in this country and in England, securing to the inventors the right to manufacture

white lead by this process, or by a modification of it, in which carbonated alkalies and acids have been applied to correct the defect in color. The carbonates will not act upon the metal unless pioneered for by oxygen gas and a vegetable acid; and sulphuric acid which forms a white salt with the protoxide of lead, renders it insoluble in linseed oil, and disqualifies it for a pigment.

If the alkalies be used with the vegetable acid salts of lead, the product, it is believed, will be a bi-carbonate, deficient in body, and will prove a more expensive process of manufacture than that practised at Clichy.

(TO BE CONTINUED.)

[For the American Repertory.]

MECHANICS' INSTITUTE.

CONVERSATIONAL MEETINGS.

SUBJECT, *Mortar.* It has been well ascertained that the mortar used by the ancients contained a much smaller quantity of lime than that now in use, but its admixture with the silex or sand is much more perfect or intimate. From the best accounts of their processes of making mortar, it appears that it was formed many months before being used, and placed in a pit dug in the ground, until wanted. After a few months it was taken up in a state nearly or quite untenacious, and beaten until it became perfectly soft or pliant, which, without the addition of water, will take place if sufficient labor be given in its manipulation. By this means every particle of silex or sand became coated evenly with the lime, and consequently it had a fair opportunity of bringing the particles within chemical distance of each other, which cannot be the case in the modern mode, of simply *hoeing* the mortar.

Bricks are usually covered with a slight coating of moulding sand, which is unattached; this should first be removed, or the mortar will attach itself to it, instead of the brick, and the want of this process will fully acount for the *clean* condition of bricks when removed from walls built within the last fifty years. They should also be well washed and wetted before being used; by

this means the excess of lime is partially taken up by the water, and, on parting with the excess of water by evaporation, the lime forms a sort of dove-tail between the mortar and the capillary openings in the bricks. When we recollect the fact that seven hundred pounds of water are required to dissolve one pound of lime, it must be evident that the larger the quantity of water used, in the first instance, the more intimate must be the connection after its evaporation. When the bricks are dry, the mortar is robbed of its water, before its parts are sufficiently connected with each other.

It is a common fault to require the use of a larger quantity of lime than is necessary, and, as labor is more expensive than lime, the master mason is very willing to accede to such a request; as by a large addition of lime the mortar becomes for the moment so malleable or soft, that a workman can lay fifty per cent. more bricks in the same space of time. Such excess, for want of intimate admixture, soon changes to carbonate of lime, (isomeric with chalk) and being without a due proportion of silex, has no tenacity.

Sea sand should never be used; first, because it contains a quantity of chloride of sodium (common salt) upon the surface of the particles, which attracts moisture, and prevents its drying; and secondly, because from long attrition the particles become spherical, (round) and thereby have less tenacity than in any other form. In the choice of sand for making mortar that which contains much loam should be particularly avoided, its particles being too minute for adhesion. Broken marble is an excellent substitute for sand, the shape of its particles being extremely irregular, and its surfaces so fresh and clean as to offer no oppposition to adhesion.

A member stated the fact that if six bricks were well cleansed of the moulding sand, and placed after being wetted, with *well worked* mortar between them, a weight of 80 pounds could be raised attached to the lowest brick, by lifting the uppermost one, in six hours after their arrangement. Whereas two bricks placed together, with ordinary mortar between, without being cleansed or wetted, could not be raised in the same manner without separating.

STEAM FIRE ENGINE.

In these evil days, when that destructive agent, Fire, is continually spreading its devastation around, demolishing the fair fruits of anxious labor, and withdrawing for ever from the community in general, millions of capital, which, being preserved and circulated would probably have gone far to prevent the commercial embarrassments that are every where felt; it becomes the ardent wish of all well disposed persons to devise or to witness the operation of an instrument calculated to mitigate, even if it cannot prevent, calamities such as of late have become so awfully frequent, both in city and in village, in crowded towns and in isolated dwellings.

It is not our province here, to enter into the consideration of the causes, nor to suggest means of prevention, so far as the conduct of mankind for vigilance and rectitude are concerned; but taking the mere fact, that fires are awfully numerous and destructive, and that every day witnesses the diminution of private property as well as the abstraction of public wealth, through these dreadful conflagrations, we anxiously turn to inquire what steps can be taken in the mechanical and scientific world, to assist the sufferer, by arresting the progress of the evil.

In this view of the matter we are pleased to see that the *Mechanics' Institute of New-York*, is among the earliest in promoting so beneficial a purpose; for we find that a resolution of the *Institute* was carried unamimously, on the 7th January last, to the following effect:

"*Resolved*, that the gold medal of the Institute will be awarded for the best plan of a *Steam Fire Engine;* the plan to be illustrated by proper drawings, or by a model. Such plans only, with their illustrations, will be admitted for competition, as shall be con-considered useful. The plans, &c. to be submitted to the "Committee of the Institute, on Arts and Sciences," before the 4th day of July, 1840, and not to be opened by the committee before that day, unless by the consent of the proposer."

Now, this is a noble and liberal offer, and quite to the extent to which an institution of this nature can proceed. It will form a proud distinction to every lover and follower of the mechanic

arts, and every cultivator of science on account of its beneficial effects to mankind; it will doubtless be a sufficient stimulus also to many who aspire to transcend in skill, and utility, the mass of their fellow citizens; but how much further will their zeal be carried out, when they reflect that, haply, their invention may be the instrument to save numerous lives and immense property; that they may be becoming the benefactors of the human race; and, even that their ingenuity, although a happy specimen and replete with good, may be but an important stepping stone to more grand inventions, of which they may be considered the founders!

We feel assured that this call on mechanical genius will meet a warm response, and that the energies of many an ingenious artizan will be called into action for so patriotic an act; and we look with confidence to numerous bright and useful specimens of art, calculated for the very important purpose to which we have here called attention.

PETRIFACTION.

It was stated by a member at a late conversational meeting of the Mechanics' Institute that he had seen a tree, in Onondaga county, in this state, part of which was in the water and turned to stone, or petrified, and the remaining part unchanged.

It is usually supposed that petrified wood (so called) is a pseudo-morphous formation; in other words, that the capillary tubes of the wood are first filled with the mineral in solution, which is gradually precipitated from the water; the woody fibres between are next decomposed and pass away, leaving a new set of tubes, which in their turn fill with the mineral, and thus we have a *cast* of the wood, without one particle of the original remaining; although it resembles it so closely in appearance as to be sometimes mistaken for it.

☞ We omitted in our last number to give credit to Mr. John McNaught as inventor of the improved Steam Indicator used on board the British Queen. We were misinformed on the subject, and therefore take pleasure in correcting it. Ed.

AGRICULTURAL GEOLOGY.

Third Annual Report on the Geology of the State of Maine. BY CHARLES T. JACKSON, M. D. &c. 1839, *pp.* 276, *with a catalogue of specimens collected by him during the previous three years.*

We have long been impressed with the importance of so arranging geological reports as to make them available for the use of the agriculturist.

Nothing is more common than to hear farmers dispute as to the kind of manure best suited for particular districts, without the aid of chemistry being called in to decide the question.

We have analyses of soils of almost every ten miles square in England, and well know what crops are most thriving in each district; how easily, then, can an analysis be obtained of a soil in which the farmer intends sowing wheat; and by comparing such analysis with that of the best English wheat soil, ascertain in what particular component it is wanting. As an example in point, Duchess county, in this state, for many years was comparatively without value, until by accident it was discovered that sulphate of lime (Plaster of Paris) produced immense crops; the consequence has been sudden wealth to the land holders.

Had any proprietor compared his soil analytically with the best soils of England, for similar crops, he would have found it deficient in this article, and consequently would have availed himself of the fact, without waiting for accidental development.

Charles T. Jackson, M. D. geologist to the State of Maine, has lately published his report, and through the kindness of a friend we have it upon our table.

Under the head of Agricultural Geology, we find the following:

Of all the arts, I know of none more likely to be improved by geological examinations, than that of Agriculture; since the composition of soils indicates their fertility, or capabilities of improvement, and the causes of barrenness. The science of geology demonstrates the origin and distribution of the mineral matters, constituting the basis of all soils, to which they chiefly owe their peculiarities. I know that it is a favorite opinion with many agriculturists that the mineral constituents of a soil have but little, if any influence on their fertility; and that they suppose the whole secret resides in the presence of certain vege-

table or animal matters; but such a theory is at once exploded by an attentive examination of the natural soils, with their peculiar vegetation; for it will be seen that there are regular zones of vegetation, peculiar to each geological district, in which the same vegetable or animal matters are present, but which differ essentially in their mineral constitution. Thus how different is the soil derived from granitic rocks, from that which is formed by the disintegration and decomposition of limestones and slates. How peculiar is the vegetation which follows the great bands of trap rocks, and how remarkable is the growth on the ancient clay loams of tertiary deposition. Whoever considers the attempts made to raise wheat upon soil totally destitute of lime, will at once appreciate the value of that mineral substance, and its importance in the production of grain. An imperfect or blighted product is sure to follow the planting of this grain upon soils destitute of lime, while it is well known that certain districts, where the soil contains this mineral, are always favored with luxuriant and heavy crops. This is one of the settled points in agriculture, and one which every farmer should duly appreciate, if he wishes to prosper in his art. Indian corn requires but little, if any, lime, and hence we see excellent crops of that grain raised upon sandy plains, unsuited to wheat. Rye, likewise, will do pretty well without it, but it is always more full and heavy where it exists in the soil; and by attending to this circumstance, the value of the crop may be greatly improved.

We regret that our space will not admit of further quotations from this most valuable document; but suffice it at present to say, that Dr. Jackson has given tables of soils in Maine, with the successive crops from each. By these tables the farmer can readily ascertain what crops can be raised without manure, and what manure is necessary for raising particular crops; we consider the Doctor entitled to the warmest thanks of Agriculturists.

The other parts of the report are distinguished by equal ability, and numerous practical uses are suggested for the different minerals described Ed.

For the American Repertory

APPPRENTICES' LIBRARY

Of the General Society of Mechanics and Tradesmen.

Mr. Editor:

You, in common with all enlightened, benevolent, and liberal men, cannot but derive pleasure from the knowledge, that numerous plans are in operation, both at home and abroad,

for the promotion of intellectual and moral improvement, and consequently of the harmony and order of society, and the happiness of its members. When you are informed of any new effort for the attainment of an object so greatly to be desired, you will doubtless be ready to hail it, with cheerful and hearty wishes for its success. You will not therefore refuse a place in your useful pages, to the following paper, which, with several others, owes its origin to an undertaking of the kind alluded to. It was written by an apprentice, who is learning the trade of a blacksmith; and it was read by the writer, on the 30th of January last, before a number of young men, mostly apprentices like himself, assembled in the lecture room connected with the Apprentices' Library, in Crosby Street, in the Institution of the "General Society of the Mechanics and Tradesmen" of this city.

My object in desiring its publication is, to direct the attention of apprentices and others, to the library and the lectures established for their benefit; also to encourage those who already avail themselves of the institution, in the exercise of writing on any subject with which they may think themselves sufficiently acquainted, and reading their productions; or, if they prefer it, allowing them to be read by others, before their companions. This exercise, it is believed, will greatly tend to draw out their faculties, improve and strengthen their minds, give them confidence in themselves, and facility in using the knowledge they may have acquired.

It will hardly be disputed, that in these days of steam printing, sufficient time is not always allowed for the mind even to comprehend, what is read, much less to arrange and digest it, before some other subject is brought forward; so that a great many books may be read, yet, but little knowledge attained. Its surface, perhaps, is extensively but superficially skimmed over, while its depths are seldom explored, or its treasures brought to the light. The exercise of committing to paper the import of what we read, together with our own thoughts on it, will help to correct this habit of superficial reading, as well as greatly assist in giving distinctness and vividness to our impressions

and fixing them in the memory, and will thus render them useful for the purposes of life.

As to the merits of the paper itself, profound scholarship, original views, or thoroughly wrought argument, was not to be expected; yet, assuredly it is highly creditable to the writer, and shows that *his* reading has been accompanied by both reflection and observation. In its tone and spirit it appears to be intended not to detract from a just degree of respect and consideration for others, but to call the attention of young mechanics to their actual position in society; and, by presenting them them with elevated views of the usefulness of their several occupations, to ennoble their aim and their ambition, and to impress upon them the important truth, that only by the improvement of the mind can they hope to attain their true position, in the estimation of their fellow citizens, and to fill their places in society with usefulness to others, and credit to themselves.

Not doubting, Mr. Editor, your willingness to lend your aid to promote this design, it is hoped that the insertion of the paper will not be found incompatible either with your views or arrangements. S.

ON THE POSITION OF MECHANICS IN SOCIETY.

Gentlemen of the Committee,

I cannot offer this communication without expressing my heartfelt thanks to you for the interest you take in the instruction of apprentices; and permit me to say, that I think we shall reap great advantages from the plan of allowing us to express our views on any subject we think proper. I have little hope that you will approve of either the subject I have chosen, or of the manner in which I offer my thoughts on it; I know, however, you will make every allowance for the first attempt of an apprentice; but whether you consider the following remarks appropriate or not, one feeling shall be always uppermost in my heart, a feeling of gratitude for the exertions you are making towards the enlightenment of our minds.

E. C.

FELLOW APPRENTICES:

In consequence of the proposition made to us by the committee of the society, attached to the institution, I appear before you for the purpose of offering my views on a subject of my own choosing. The subject I have chosen, is the utility of Mechanics to Society, and the station which they hold in it. I must say that I entertain very little hope of being able to give much satisfaction. I know, however, that you do not expect to hear anything learned from an apprentice, and, that whatever errors I make, in this short attempt to express my thoughts, will be forgiven and looked over. I have sometimes reflected on mechanics and tradesmen as a separate body, and it has occurred to me, that they do not hold a very elevated rank in society. This will appear to us more surprising, when we consider that the world is chiefly indebted to them for the greater part of its necessaries and comforts. If then mankind are indebted to them for the greater part of their necessaries and comforts, it follows, that they must be the most useful members of society; to satisfy ourselves on this point, we need only cast a glance at what is passing around us;

almost every thing that offers itself to our view, affords a proof of the benefit arising from the labors of the tradesman and the mechanic. What a fund of delight, what a field of instruction, does it not present to our minds, to mark the progress of manufactures from their first simple origin to their most perfect state! How pleasing it is to look on the exertions of any one class, from the making of a small boat, which may serve perhaps for the accommodation of a pleasure party, to the building of a large ship, which assists every branch of trade, and commerce, which is one of the chief means of the defence of nations, and which serves to carry the lovers of knowledge and science in search of new wonders, and in the exploring of unknown regions. Let us turn our eyes from this; let us take a look at ourselves and we shall find that the clothes which we use as a covering for our bodies, which serve to protect us from the inclemency of the weather, and which are indispensable to our comfort, are supplied to us, by the labor of the wool gatherer, the spinner, the weaver, the dyer, the carpenter, and the machinist; but perhaps I cannot better illustrate this subject, than by pointing out the advantages derived from the trade, to which I am an apprentice; I mean that of a blacksmith. Taken in its different branches, nothing can afford a more convincing proof of the ingenuity and skill of the mechanic, than the working of iron, in various ways. What reflections does it not cause to arise in our minds, when we look at the simple ore contained in the earth, manufactured into so many things, of so much benefit to man! We see all our domestic utensils made by one branch, a great many of the tools of the carpenter, and of almost every other mechanic supplied by another; the vaults of banks, the railings, and balconies, which are so much of an ornament and advantage to our houses, and a great many of the utensils of the farmer are likewise the work of their hands; but, that wherein their great skill is displayed, and where this labor is most beneficial, is in the manufacture of that greatest and most beautiful of inventions, the steam engine. Here we behold a mass of the most complicated machinery, with the greatest regularity, and serving for the most useful purposes; made to assist in almost every branch of trade, and conducting produce on our rivers and railroads, with the greatest rapidity. I need not, however, go on to point out its advantages; neither need I bring forward more proofs of the utility of the mechanic; these things are apparent to every one who takes time for a little reflection. I must say, however, that many of the wonders and beauties of natural philosophy would be unknown to us, were it not for the assistance rendered by mechanical arts. It is true that the philosopher can go a great length unaided, but many things, of which we are now certain, would rest, perhaps, on conjecture, had it not been for the telescope and other instruments for the promotion of science. But, although every thing we see passing around us convinces us of the utility of the mechanic; every thing, from a small boat, to the building of a ship; from the manufacture of a pin, to the production of a steam engine; although the labors and researches of the philosopher are aided by them, yet, in my opinion, they hold only a secondary rank in society. It will not, I presume, be disputed, that people generally look upon those who are surrounded with wealth, with more respect than they do on the working man; those persons in their turn who roll in every luxury that riches can procure; those persons who occupy the higher ranks, and follow what are styled the learned professions, look upon the man who earns his bread by the sweat of his brow, with feelings of indifference, if not of secret contempt; they seem to pride themselves on the possession of things which, perhaps, they had no hand in acquiring, and which were probably bestowed on them by birth or the blindness of fortune. It is a cheering reflection that talent or genius is not confined to these people. Wealth may procure luxuries, it cannot, however, add one iota to the formation of the mind. The greatest men that the world has ever produced, have come from the poorer class of people. Look back to the time of the revolution, to the times that tried men's souls, and we shall find that many were tradesmen and mechanics, who contributed to establish the independence of this country, and around whose name a halo of glory now rests, brighter and more lasting than could be procured by the wealth of all the nations of the earth. But there are proofs which we can behold every day, which afford strong arguments that many mechanics must possess superior minds. Look on this city; look on some of its beautiful architecture; look on many of its noble edifices, and tell me if it does not require a man of superior mind to lay the plan of one of these! Yes, the man who draws the plan of one of these edifices, must possess genius and talents; and, perhaps when some of these lords, who would think the touch of a mechanic contagious, were plundering the ancient temples of Greece, for the purpose of adorning their private cabinets, it never occurred to them, that the men who constructed those noble specimens of architecture, must have possessed minds far superior to themselves. There are many persons in possession of great wealth; some have procured

it by their industry, and on some it has been bestowed by their birth, many of them I know, possess the most noble minds and the brightest genius, I do not mean to say they are all in possession of such narrow sentiments as to despise the working class, but I think I can boldly assert from my own observations, and from what I see passing around me, that mechanics are considered as holding only a secondary rank in society; and why fellow apprentices is it considered so? Chiefly, in my opinion, because they have not been careful enough to increase their knowledge by study. The majority of mechanics have remained satisfied with being good workmen; but they ought to reflect that unless a man possesses more knowledge than what he derives from his trade he will never be qualified to hold any important station, nor will he ever be much respected. It is true that many of our class have attained to the highest distinction, and they afford a striking proof of what others might attain if they would only follow good example. It may be said that we require some amusement after the fatigues of the day; but the most pleasing and rational amusement is to increase our stock of knowledge. What a source of delight it would be to us if we knew the properties of the materials we use in our different trades, and of what they are composed! But it may be also said, that a person who is learning a trade cannot afford much time towards the improvement of his mind. I cannot better refute that idea than by mentioning the name of *Benjamin Franklin.* Is there any apprentice, is there any tradesman, is there any mechanic, whose heart does not beat with joy, when he can point to that eminent individual as one of his own class? How did he become so distinguished? It was by devoting his leisure hours to useful and profitable study! Would it have entered into the imagination of any of those persons who may have looked on Franklin, when he first walked along the streets of Philadelphia, with his bundle in one hand and a roll of bread in the other, that he was yet to become the greatest philosopher of the age; that he was yet to divest the lightning of its terrors, and teach mankind how to guard against its effects? We know this has been the case, and although it would be difficult for any of us to think of attaining his eminence, yet we ought to look on him, as an example of what may be gained by exertion. And here let me say, that he had not so many opportunities to improve himself, as we have; ought we not, therefore, to feel thankful to the society of mechanics and tradesmen for the exertions they are making in our behalf? Look at the advantages we posses; we have a library, where we can procure the works of the choicest authors; we have lectures delivered to us by eminent and learned individuals; and we are allowed to express our thoughts on any subject. Let us, fellow apprentices, evince our gratitude for these things, by our exertions to improve our minds; let us give up vain and frivolous amusements, and devote our leisure hours to increasing our stock of knowledge. Let us do this, and we shall have the gratification of knowing that we contribute something towards raising mechanics to where they ought to be, amongst the first, the most learned, as well as the most useful members of society.

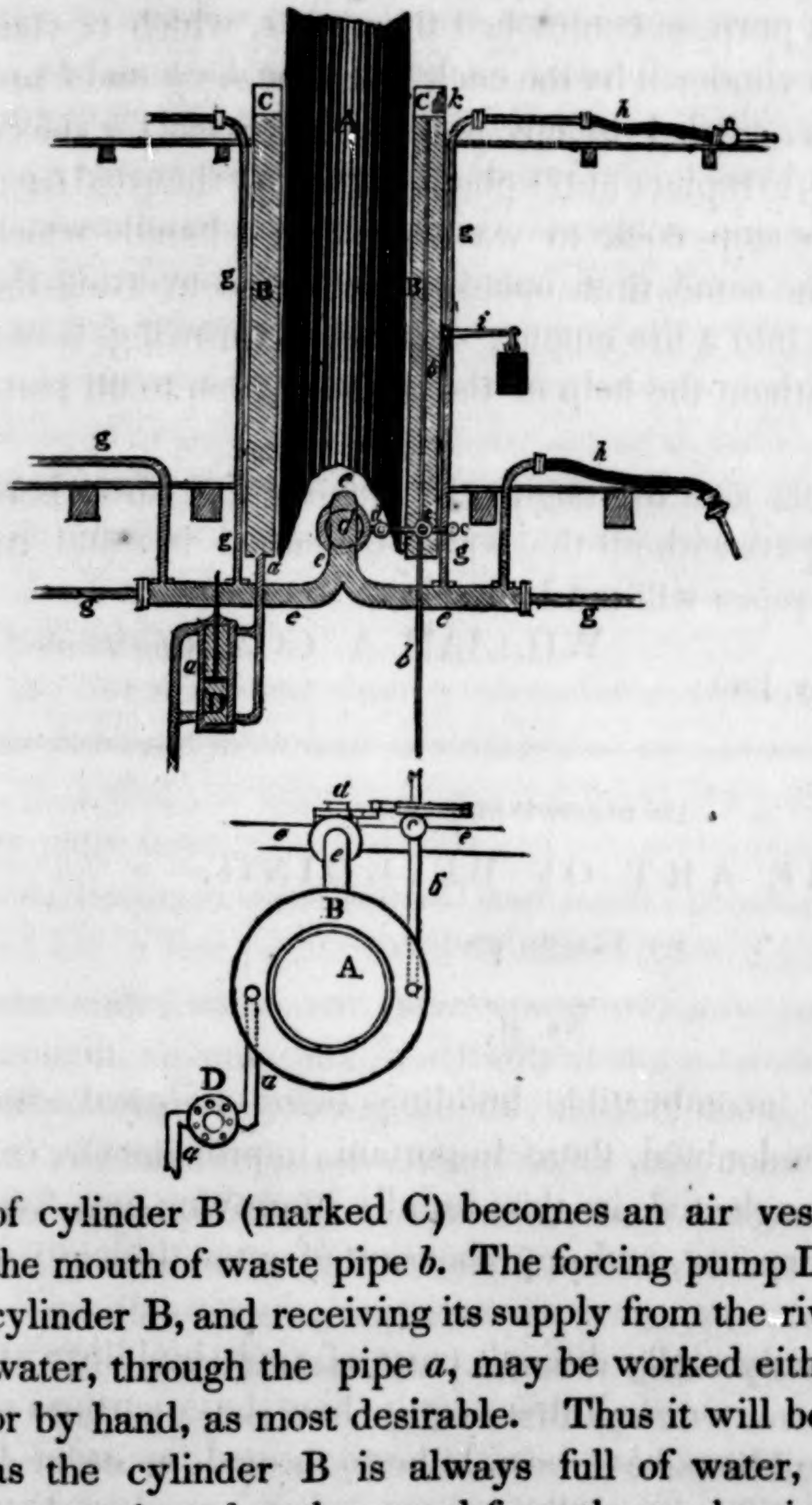
We have not presumed to tamper with the style of this interesting essay. As it stands it affords striking proof of the eminent advantage arising from the liberal provision made by the Mechanics and Tradesmen's Society for the cultivation of the mind among apprentices and youth generally. We trust and believe it will stimulate many a one to self-examination, and urge them both to increase of knowledge and to the delicate art of expressing clearly what they may understand truly. Ed.

Report of the Committee on Arts and Sciences of the Mechanics' Institute, on H. R. & J. E. Serrell's *means of preventing and extinguishing fires in steam vessels.*

The recent calamity of the burning of the Lexington has roused the public mind on this subject, to so great an extent that

numerous plans have already been proposed for the prevention of such occurrences in future. Not one of these, thus far presented to the committee, appears so perfect in all its parts as that of the Messrs. Serrell.

The engraving represents a cut section and plan. A, smoke pipe of the engine. B, cylinder, concentric with smoke pipe, leaving an annular space between, of from six to ten inches. *b*, waste pipe, reaching to within 12 inches of top of cylinder; its lower end passing through cylinder to lead off the surplus water. The cylinder B extends from top of boiler through the main and promenade decks.—The upper part



of cylinder B (marked C) becomes an air vessel, being above the mouth of waste pipe *b*. The forcing pump D, used to supply cylinder B, and receiving its supply from the river or condensed water, through the pipe *a*, may be worked either by the engine or by hand, as most desirable. Thus it will be perceived that, as the cylinder B is always full of water, no fire can be communicated to the vessel from the smoke pipe, and the annular space between smoke pipe and cylinder B is sufficient to prevent the cold water from injuring the draught of the fire. Part of the heat given off by the smoke pipe can be made

available, by feeding the boiler from the waste pipe *b*, which would give a supply of warm water.

In addition to the above enumerated advantages, the inventors purpose to convert their apparatus into a fire engine, to extinguish the fires which may occur in other parts of the vessel. For this purpose is attached the main *e*, which is connected with the cylinder B by the cock and tube *d*. *g* and *h* are hose pipes to be carried to any part of the vessel; *i* safety valve; *k* air valve, to replace atmospheric air when exhausted from air chamber C; *r* stop cock to waste pipe *b*; *c* handle which shuts *r*, and at the same time opens *d*, thereby converting the whole apparatus into a fire engine, capable of throwing water either with or without the help of the steam engine, to all parts of the boat.

When not in use as a fire engine, by opening the lower hose pipe *g*, so as to part with all the water contained in *e* and its connections, the pipes will not be liable to freeze.

WILLIAM A. COX, *Chairman.*

New-York, February, 1840.

[For the American Repertory.]

THE ART OF BUILDING.

BY JAMES FROST.

No. II.

The value of incombustible buildings being so great, and their utility so undoubted, these important improvements, can only have been neglected in this rapidly improving age, from dread of great expense, and apprehension of great difficulty in the execution.

Now, as the only really difficult parts of such buildings are the roofs and floors, we shall first enquire how these portions of incombustible buildings have been hitherto formed, in order to ascertain what difficulty really exists; what remedies have been applied, and what success has been obtained.

In ancient structures very massive arches of great comparative height, were employed; in modern, lighter or lower and

flatter arches have been used; although in all periods, arches of many varieties of curvature have been adopted, viz: semi-circular, semi-elliptic, segments of either, double segments, or pointed gothic, parabolic equilibrated, &c. groined or intersected arches of every variety of curvature before enumerated; yet, various as these forms may seem, they are all reducible to one distinct kind, being all arches of single curvature only, or what workmen term circular work, as distinguished technically from circular circular work, as arches of double curvature, spherical segments, or similar double curves; the peculiar useful properties of which have been strangely overlooked and neglected, and will therefore require to be hereafter fully dwelt on.

At present we shall confine our attention to only one kind of arch of single curvature, the groined arch; because it has been much more extensively used than any other, and has been thus preferred for the following good and efficient reasons:

1. For the smaller quantity of materials than is required for plain arches.

2. For a greater degree of stiffness, caused by the angular bonded intersection of the arches.

3. From the smaller space occupied by groined arches than by plain ones.

4. From all their vertical and lateral pressures being condensed into a few points, as to the four angles of a single room only, where the walls are not required of any particular general strength, except only in a few places; a circumstance of great value in peculiar forms of building.

5. From their great susceptibility of ornament, beauty, and grandeur; which latter qualities, many ancient groined arches exhibit in an admirable degree.

These fascinating appearances were on many occasions obtained in most elaborate masonry at great cost; yet in other instances the same were gained with great economy and effect, as I witnessed in the conversion of some ancient monastic buildings to modern purposes. These buildings, each about two hundred feet in length, and thirty-five feet in clear in width between the walls, contained in the centre of each, a row of ten fasciculated columns, from whence, and from corresponding op-

posite semi-columns placed against the walls, spring pointed gothic arches, with angular moulded ribs, and a proportion of smaller arches interlaced in intricate tracery of very pleasing forms.

These arches presenting externally the appearance of solid stone, although then of the age of six centuries, seemed made to endure for ages; yet on removal were found unattached to the walls of the buildings, and composed of plastered surfaces. The angular and other ribs of brick, originally moulded to the required forms, and the large plain or main surfaces of the arches were formed of common bricks, four inches in thickness only; while the spandrills, or large space above, forming the body of the arch, were filled in with mould, which supported the stone floor above as firm as a rock.

As these ancient and beautiful arches and floors, though so strong and durable, contained only one fourth the valuable materials employed for the same purpose in modern structures, (the mould being valueless) they exhibit a desirable combination of great ingenuity with economy; and, being the production of what is now termed a dark age, may teach us not to be too proud of our present all-sufficiency.

But these ancient arches and floors were very ponderous and massive. Their least average thickness of mould and masonry being four feet, their weight exceeded four hundred pounds per superficial foot of floor, while the greatest load calculated for as many persons as could congregrate thereon, being about one cwt. per supl. foot, and the arches and floors were four times as heavy as their load: their whole weight loaded would amount to twenty five tons per square. The floors, occupying each four feet perpendicular height in the building, consumed a large space thereof, and the great weight of these arches pressing on a few points only, vertically and laterally, with corresponding force, demanded a large mass of masonry in walls and buttresses to support and to resist this enormous lateral pressure, four fifths of which we have seen were expended to support one fifth its greatest incumbent load, besides rendering a very considerable portion of the building useless.

These united considerations, have led to considerable im-

provements, specimens of which may be seen in those splendid works, the new Exchange and the new Custom House, in the city of New-York. In these magnificent works numerous floors are constructed on groined segment arches, about the average thickness of two feet, their height and weight consequently only one half that of the ancient arches previously described, and thus occupying only one half the perpendicular space in a building, are greatly preferable. But these modern arches, spandrills, and floors, being formed of a solid mass of cemented brick work, require nearly four times the quantity of valuable material for an equal superfices of the ancient floors. From the less weight of these improved arches, only one half the vertical pressure is borne by the walls; yet from their lower altitude they exert as great horizontal thrust, and still require as great a sacrifice of space and masonry to support the continued lateral pressure; and their gross weight is still double the weight of the greatest load they are constructed to bear.

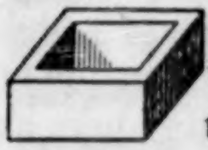
In these two works, the production of different artists, may be seen a singular difference in the result of the employment of the same means to accomplish the same ends, each artist using thick walls and buttresses to resist the lateral pressure of groined arches; yet the employment in one building of interior, and in the other of exterior, buttresses, secures much more internal and useful space in the former, and with a far better appearance externally than in the latter—a valuable instance of great effect obtained without cost.

Attempts were made many years ago, both in London and in Paris, to reduce the weight of arches, by substituting hollow pots, [coombs] for the solid bricks commonly used.

These hollow pots, externally of a square form, internally circular, with one solid end, like common garden pots, were but of little more than half the weight of brick; yet but seldom used, because they were a very expensive substitute, always limited in use to plain arches, their shape rendering them inadmissable in groins, a form generally preferred. Similar pots, though of an inferior form, are found in ancient arches.

Having thus obtained a concise and popular view of favorable and improved specimens of ancient and modern incombustible floors, as supported by arches, for the sake of comparison with the improvements I have to introduce, I shall now proceed to detail the result of numerous experiments, occupying a long period, conducted at considerable cost, and terminating full of promise of extensive improvements resulting therefrom.

My first attempt succeeded in procuring a very cheap and very preferable substitute for bricks (which being formed of sandy loam are weak and heavy) by manufacturing from strong tenacious clay, by machinery, hollow earthen ware tubes,



square in the section, the apertures thereof being two thirds as large as the area of the tubes; and thus from the great strength and natural levity of the material, and from the large proportional aperture, these tubes were of much less than one third the absolute weight of a corresponding quantity of brick; yet an all sufficient substitute therefor in arches, as numerous trials have fully and satisfactorily established.

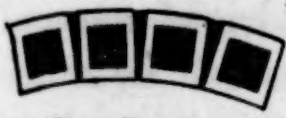
Although these tubes may, at first sight, appear inadmissible for the construction of groined arches, as they neither admit of cutting at, nor possess sufficient strength to form the angles of groins, yet they may be easily and efficiently adapted thereto by the introduction of a small rib of cast iron, at each angle of the room, each rib being furnished with a double projecting and moulded edge, as here represented;

these angular ribs, receiving the whole weight of the groined arch, transmit all the weight and all the lateral pressure thereof to four small iron bearing-plates, each one situate on the walls in the corner of the room; and these plates being easily and effectually connected by flat iron bars, (or iron bond) the lateral thrust of the arches will thus be effectually resisted, and the walls perfectly relieved from any lateral thrust whatever, in any and every part, a property derived from the peculiar form of arch under consideration.

Now, upon these tubular arches, tubular ribs may be placed, twelve inches asunder, to support a tubular counterfloor, to

receive a coat of cement; we shall then obtain a substantial and incombustible arch and floor, little if at all exceeding forty pounds in weight of each supl. foot of floor over rooms of moderate dimensions, and possessing many other peculiar advantages, to be hereafter detailed. It is almost superfluous to add, that plain arches of a moderate span may be constructed equally light, upon the same principles.

My next attempt consisted in the employment of arches of double curvature, or spherical segments, which will in many cases be found greatly to surpass all others in stability, solidity, and economy. This form, possessing immense strength, admits, also, unrivalled lightness, having the peculiar property of being strong in itself. While all arches of single curvature require great loading to enable them to sustain any weight whatever, and most of them being unable to sustain even their own weight without a considerable load thereon, these spherical arches are free from this great defect, and may be even left open at the crown, should light, or any other desirable object, be thereby attainable, without the least diminution of their strength. Common sized floors have proved abundantly strong, supported by arches formed of one course only of hollow tubes, three inches to four inches square in the section, or on an arch three to four



inches thick, and consequently not of greater weight than one inch of common brick arch.

On these tubular arches, tubular ribs were placed a foot asunder, to support a cemented tubular counterfloor, or a stone or other floor.

The whole space occupied by arch, spandrill, and floor will be less than one third, and the absolute space and weight less than one fourth, of the best floors, and the very latest production of two of the most talented artists.

As these floors, arches, and ceilings will not weigh forty pounds per supl. foot, they will not require thicker walls than the common combustible ceilings and floors; for, wooden floors weighing less than 30 lbs. per. foot supl., are supported by only two walls out of the four; while these arches, resting alike on all four walls, consequently press less upon each wall when loaded, than floors of timber, and which will be found also, on comparison, to

occupy a greater average absolute space than these substantial and enduring substitutes, because they occupy so very little space at the crown.

But we have seen groined arches are of great weight, resting upon four small feet only, where a corresponding great lateral pressure being exerted, to resist which it has hitherto been deemed essential to employ a great quantity of materials, in the form of thick walls, buttresses, or of both. The great expense of this, onerous and forbidding as it is, forms but a minor part of the evil in valuable situations, because an enormous quantity of space is sacrificed for this purpose only. For when to the space lost vertically is added that lost horizontally, one third of the useful available room in a building is commonly destroyed ; so that by the employment of an improved mode, not only a vast expense of time, labor, and money may be saved, but half as much more available room be obtained on the same surface, and two lots thus appropriated, afford as much as three vaulted in the usual mode.

These desirable results are secured by balancing the lateral pressure of one part of the arch against its opposite portion, instead of the present mode of balancing the lateral pressure of an arch against the pressure of enormous walls and buttresses; and these advantages can be secured by employing arches of less than one fourth the usual weight, with bearings equally diffused over an extensive surface, being nowhere intense or great, can be readily and cheaply resisted, by connecting the bearing walls with diagonal or parallel tyes, or both. These tyes, being concealed within the hollow spandrills, between the incombustible floors and arches, in this peculiarly secure situation timber tyes may be safely employed in ordinary buildings, by those desiring to save the additional expense of metal, and as wood can now be preserved at little cost for an indefinite period, durable and inexpensive tyes are thus attainable.

In valuable buildings, metal tyes will be so securely protected in these air-tight and temperate situations, as to remain uninjured to remote ages, and as bars requiring little labor for conversion serve for these purposes, the expense of metal will not be found objectionable.

But these enduring floors possess several other important advantages, from their peculiar formation. It is well understood, that a stratum of confined air is an almost perfect nonconductor of heat, cold, or sound. Now, as each of these tubular arches, spandrils, and floors, contains a stratum of air, the combined action of three strata must render them perfectly impervious to heat, cold, or sound, and their firm construction and sound cemented surfaces will as effectually obstruct the passage of any offensive odor or noisome or pestilential exhalation. These floors, then, are in every one of these important respects immeasurably superior to the common combustibles.

The materials for these floors being as inexhaustible as cheap, and easy of conversion, the expense thereof being principally for labor, the expenditure therefor will remain at home, and the timber hitherto employed, of the most valuable kinds, will remain an important article of export, advancing the immediate resources of the country, as well as its permanent prosperity, by the exchange of perishing combustible wood for enduring and incombustible buildings.

As such great strength has been herein attributed to arches of double curvature, an experiment may be easily made as satisfactorily exhibiting their superior strength, compared with common arches of single curvature only.

Take two pieces of similar tin plate, bend one piece into any single curved arch, and apply such a weight on the apex thereof as will cripple the arch. Then having formed the other tin plate into a spherical segment, it will support uninjured a great weight, perhaps, scores of times the weight which crippled the first, and this superior power is evidently derived from the form alone. And to show the strength of the hollow tubes, take one, only three inches square externally, and two and a half inches square internally; its sides being only one fourth inch thick; its length being twelve inches; now embedding it

horizontally, thus, on a portion of cement at each end, and bedding a small piece of iron across the middle of upper side, apply weights gradually increasing till the tube is broken.

A good tube of this size will support full eleven hundred

weight, and from this and other experiments may be deduced the fact. The material possesses both a tensile and a resistile force, each exceeding a ton upon the sections of a superficial inch, being fully equal to half the similar powers of good fir timber.

Here, then, for the present, we must postpone the subject of improved arches, to proceed with the construction of incombustible floors and roofs, without arches; but we are not to assume the consideration of the useful properties of arches as terminated, but, on the contrary, as a future subject of intense interest.

(TO BE CONTINUED.)

NOTICES OF FINE ARTS.

ENGRAVED PORTRAIT OF GENERAL HARRISON. *Published in Philadelphia.*

We have just seen this very beautiful mezzotint, executed by J. R. Sartain, from a picture by J. R. Lambdin, painted in 1836. As a likeness it is unquestionably good, and as a production of art is decidedly one of Mr. Lambdin's best efforts. The engraving is in the highest style of excellence, and very creditable to our sister city.

An amateur of this city has lately received, from London, a picture by Sir David Wilkie, which, we understand, he generously permits to be examined by the lovers of the art. We cannot doubt that such a gem will prove highly instructive.

The work is, in every degree, worthy of the very high reputation of the artist. The subject is exquisitely conceived, beautifully composed, and in that peculiar excellence of the present English school, *light* and *shadow*, is surpassingly beautiful. The general impression, however, among our artists, seems to be that it is less finished in the detail than Sir David's earlier works. The amount paid for this picture we understand to have been $2,000.

We were much pleased, a few days since, with a group of portraits, miniature size, painted by our esteemed friend Mr. T S. Cummings.

It is composed of three figures, two of which are engaged playing chess, and the third watching the progress of the game. Nothing is more difficult than the management of drapery and other accessary parts of a picture on ivory, and yet all these are so composed as to combine the force of oil painting with the beauty and delicacy of miniature. We have long been an admirer of this beautiful art, and perpetrated some specimens of our folly; but in viewing the work of Mr. Cummings, we freely confess that our own insignificance becomes more apparent than meets the approbation of our self-esteem.

This gentleman may, unquestionably, be said to occupy the first place in his department of art. His style is quiet, just, and unobtrusive; he represents nature as she is, and not as the crazed imagination of a poetical enthusiast would depict her.

Unfortunately for the painter in small, his works do not occupy sufficient space to catch the eye of the sapient critic, and but few, therefore, have ever received the reward of praise due to their merits; but when it is recollected that they are required to represent nature in a reduced size, with at least as great accuracy as the oil painter, and this too, with the most fragile materials, it cannot be doubted that they are entitled to, and should receive, at least an equal rank with those engaged in any other department of art.

W. Page, A., is again destined to surprise his friends. We had the gratification, a few days since, to view a composition, intended for the next exhibition of the National Academy of Design, consisting of a group of three figures, namely, of a soldier, his wife and child. The father is blowing a whistle behind the child, who, surprised at the sound, looks up at the mother to ascertain from whence it emanates. The pleasure of both parents is happily depicted, and the surprise of the child does great credit to the imagination of the artist.

The daring arrangement of color, and the complete mastery of the consequent difficulties dependent upon toning a picture to so high a scale, would do credit to Gainsborough. We pronounce it, without the fear of contradiction, a chef d'œuvre of art.

THE DAGUERREOTYPE.

We give below a description of this most interesting discovery, and take great pleasure in stating that several gentlemen of this city, among whom, we may name Dr. Chilton, President Morse, and Professor Draper, have fully succeeded in procuring fine specimens of photogenic drawing, by *means of this instrument.*

Translated from the original paper of L. J. M. Daguerre, (the inventor,) by J. S. Memes, L L. D.

Practical Description of the Daguerréotype. Material to be employed in the photogenic process. Five steps of the process explained. Polishing the white coating with Iodine. The Camera. Mercurial process. Fixing the impression, with descriptions of the Apparatus.

The designs are executed upon thin plates of silver, plated on copper. Although the copper serves principally to support the silver foil, the combination of the two metals tends to the perfection of the effect. The silver must be the purest that can be procured. As to the copper, its thickness ought to be sufficient to maintain the perfect smoothness and flatness of the plate, so that the images may not be distorted by the warping of the tablet; but unnecessary thickness beyond this is to be avoided on account of the weight. The thickness of the two metals united, ought not to exceed that of a stout card.

The process is divided into five operations:

1. The first consists in polishing and cleaning the plate, in order to prepare it for receiving the sensitive coating, upon which the light traces the design.
2. The second is to apply this coating.
3. The third is the placing the prepared plate properly in the camera obscura to the action of light, for the purpose of receiving the image of nature.
4. The fourth brings out this image, which at first is not visible on the plate being withdrawn from the camera obscura.
5. The fifth and last operation has for its object to remove the sensitive coating on which the design is first impressed, because this coating would continue to be affected by the rays of light, a property which would necessarily and quickly destroy the picture.

FIRST OPERATION.

Preparing the Plate.

The requisites for this operation are of:

A small phial containing olive oil.

Some very finely carded cotton.

A small quantity of very fine pumice powder, ground with the utmost care, tied up in a bag of muslin, sufficiently thin to allow the powder to pass through when the bag is shaken.

A phial of nitric acid, diluted with water in the proportion of one pint of acid to sixteen pints of distilled water. These proportions express volume, not weight.

A frame of iron wire upon which to place the plate, in order that it may be heated by means of a spirit lamp

Lastly, a small spirit lamp.

As already stated, these photographic delineations are executed upon siver plated on copper. The size of the plate will depend of course on the dimensions of the camera. We must begin by polishing it carefully. To accomplish this, the surface of the silver is powdered all over with the pumice, by shaking the bag without touching the plate.

Next, with some cotton dipped in a little olive oil, the operator rubs the plate gently, rounding his strokes, as represented, Fig. 2. beginning from C. During this operation the plate must be laid flat upon several folds of paper, care being taken to renew these from time to time, that the tablet be not twisted from any inequality in the support.

The pumice must be renewed and the cotton changed several times. The mortar employed for preparing the pumice must be of porphyry. The powder is afterwards finished by grinding upon polished glass, with a glass muller, and very pure water. And lastly, it must be perfectly dried. It will be readily apprehended of what importance it is to attend to these directions, since upon the high polish of the silver depends in a great measure the beauty of the future design. When the plate is well polished, it must next be cleaned by powdering it all over once more with pumice, and rubbing with dry cotton, always rounding and crossing the strokes, for it is impossible to obtain a true surface by any other motion of the hand. A little pledget of cotton is now rolled up and moistened with the diluted acid already mentioned, by applying the cotton to the mouth of the phial and inverting it, pressing gently, so that the centre only of the cotton may be wetted, and but slightly, care being taken not to allow any acid to touch the fingers. The surface of the plate is now rubbed *equally* all over with the acid applied by the pledget of cotton. Change the cotton and keep rubbing, rounding as before, that the acid may be equally spread, yet in so small a quantity as just to skim the surface, so to speak. If, as frequently happens, the acid run into small drops from the high polish, change the cotton repeatedly and break down the globules as quickly as possible, but always by gently rubbing, for if allowed to rest or run upon the plate they will leave stains. It will be seen when the acid has been properly diffused, from the appearance of a thin veil spread regularly over the whole surface of the plate. Once more powder over pumice, and clean it with fresh cotton, rubbing as before, but very slightly.

The plate is now to be subjected to a strong heat. It is placed upon the wire frame, (Fig. 1, both views,) the silver upwards. The spirit lamp is applied below the hand, moving it round, the flame touching and playing upon the copper. This operation being continued at least five minutes, a white strong coating is formed all over the surface of the silver, if the lamp has been made to traverse with proper regularity; the lamp is now withdrawn. A fire of charcoal may be used

instead of the lamp, and is perhaps preferable, the operation being sooner completed. In this latter case the wire frame is unnecessary, because the plate may be held by one corner with pincers, and so held over the fire, moving it at the same time till all is equally heated, and the veil appear as before described. The plate is now to be cooled *suddenly* by placing it on a cold substance, such as a mass of metal or stone, or best of all a marble table. When perfectly cold, it is to be again polished, an operation speedily performed, since the gummy appearance merely has to be removed, which is done by the dry pumice and cotton repeated several times, changing the cotton frequently. The polishing being thus completed, the operation of the acid is to be repeated three different times, dry pumice being powdered over the plate each time, and polished off very gently with the cotton, which must be very clean, care being taken not to breathe upon the plate or to touch it with the fingers, or even with the cotton upon which the fingers have rested, for the slightest stain upon the surface will cause a defect in the drawing.

When the plate is not intended for immediate use, the last operation of the acid is not performed. This allows any number of plates to be kept prepared up to the last slight operation, and they may be purchased in this state if required. It is, however, indispensable that a last operation by acid as described, be performed on every plate, immediately before it be placed in the camera. Lastly, every particle of dust is removed by gently cleaning the whole edges and back also with cotton.

SECOND OPERATION.

Coating the plate.

For this operation, we require:

The box represented, Figs. 7 and 8.

The small board, Fig. 3.

Four small metallic bands, the same substance as the plates.

A small handle, Fig. 5. and a box of small tacks.

A phial of iodine.

The plate is first to be fixed upon the board by means of the metallic bands with their small catches and tacks, as represent Fig. 3. The iodine is now put into the little dish, D, at the bottom of the box, Figs. 7 and 8. It is necessary to divide the iodine into pieces, in order to render the exhalation the more extensively and more equally diffused, otherwise it would form circles in the centre of the plate, which would destroy this essential requisite. The board is now fitted into its position, the plate face downwards, the whole being supported by small brackets projecting from the four corners of the box, the lid of which, G, is then closed. In this position the apparatus remains till the vaporization of the iodine, which is condensed upon the plate, has covered its surface with a fine coating of a yellow gold color. If this operation be protracted, the gold color passes into violet, which must be avoided, because in this state the coating is not so sensitive to the impressions of light. On the contrary, if the coating be too pale, the image of nature in the camera will be too faint to produce a good picture. A decided gold color—nothing more—nothing less—is the only assurance that the ground of the future picture is duly prepared

The time for this cannot be determined, because it depends upon several circumstances. Of these two the principal are the temperature of the apartment, and the state of the apparatus. The operation should be left entirely to spontaneous evaporation of the iodine—or at all events no other heat should be used than what can be applied through the temperature of the room in which the operation takes place. It is also very important that the temperature of the inside of the box be equal to that of the air outside, for otherwise, a deposition of moisture takes place upon the plate, a circumstance most injurious to the final result. Secondly, as respects the state of the apparatus; the oftener it has been used, the less time is required, because in this case, the interior of the box being denetrated with the vapors of iodine, these arise from all sides, conpensing thus more equally and more rapidly upon the surface of the plate, a very important advantage. Hence it is of consequence to leave always a small quantity of iodine in the cup, and to protect this latter from damp. Hence, likewise, it is obvious that an apparatus of this kind which has been some time in use, is preferable to a new box, for in the former the operation is always more expeditiously performed.

Since from these causes the time cannot be fixed, *a priori*, and may vary from five minutes to half an hour, rarely more, unless the weather be too cold, means must be adopted for examining the plate from time to time. In these examinations it is important not to allow the light to fall directly upon the plate. Also, if it appear that the color is deeper on one side of the plate than the other, to equalize the coating the board must be replaced, not exactly in its former position, but turned one quarter round at each inspection. In order to accomplish these repeated examinations without injuring the sensibility of the ground or coating, the process must be conducted in a darkened apartment into which the light is admitted sideways, never from the roof—the door left a little ajar answers best. When the operator would inspect the plate, he raises the lid of the box, and lifting the board with both hands turns up the plate quickly, and very little light suffices to shew him the true color of the coating. If too pale, the plate must be instantly replaced, till it attain the proper gold tone; but if this tint be passed, the coating is useless, and the operations must be repeated from the commencement of the first.

From description this operation may perhaps seem difficult, but with a little practice one comes to know pretty nearly the precise interval necessary to produce the true tone of color, and also to inspect the plate with great rapidity, so as not to allow time for the light to act.

When the coating has reached the proper tone of yellow, the plate to which it is fitted, is slipped into the frame, (Fig.13.) and thus adjusted at once in the camera. In this transference care must be taken to protect the plate from the light; a taper should be used, and even with this precaution, the operation ought to be performed as quickly as possible, for a taper will leave traces of its action if continued for any length of time.

We pass now to the third operation, that of the camera. If possible the one should *immediately* succeed the other, the longest interval between the second and third ought not to exceed an hour. Beyond this

space the action of the iodine and silver no longer possesses the requisite photogenic properties.

Observanda.—Before making use of the box, the operator should clean it thoroughly, turning it bottom upwards, in order to empty it of all the particles of iodine which may have escaped from the cup, avoiding at the same time touching the iodine with the fingers. During the operation of coating, the cup ought to be covered with a piece of gauze stretched on a ring. The gause regulates the evaporation of the iodine, and also prevents the compression of the air on the lid being shut from scattering the particles of iodine, some of which reaching the plate, would leave the large stains on the coating. For the same reason the top should always be let down with the greatest gentleness, not to raise the dust in the inside, the particles of which being charged with the vapor of the iodine, would certainly reach and damage the plate.

THIRD OPERATION.

The Camera.

The apparatus required in this operation is limited to the camera obscura. (Figs. 14 and 15.)

This third operation is that in which by means of light, acting through the camera, nature impresses an image of herself on the photographic plate, enlightened by the sun, for then the operation is more speedy. It is easy to conceive that this operation, being accomplished only through the agency of light, will be the more rapid in proportion as the objects, whose photographic images are to be delineated, stand exposed to a strong illumination, or in their own nature present bright lines and surfaces.

After having placed the camera in front of the landscape, or facing any other object of which it may be desirable to obtain a representation, the first essential is a perfect adjustment of the focus, that is to say, making your arrangements so as to obtain the outlines of the subject with great neatness. This is accomplished by advancing or withdrawing the frame of the obscured glass which receives the images of natural objects. The adjustment being made with satisfactory precision, the moveable part of the camera is fixed by the proper means, and the obscured glass being withdrawn, its place is supplied by the apparatus, with the plate attached as already described, and the whole secured by small brass screws. The light is of course all this time excluded by the inner doors; these are now opened by means of two semi-circles (see illustration) and the plate is disposed ready to receive its proper impressions. It remains only to open the aperture of the camera, and to consult a watch.

This latter is a task of some nicety, as nothing is visible, and as it is quite impossible to determine the time necessary for producing a design, this depending entirely on the intensity of the light on the objects, the imagery of which is to be reproduced. At Paris, for example, this varies from three to thirty minutes.

It is likewise to be remarked, that the seasons as well as the hour of the day, exert considerable influence on the celerity of the operation. The most favorable time is from seven to three o'clock; and a draw-

ing which, in the months of June and July at Paris, may be taken in three or four minutes, will require five or six in May or August, seven or eight in April and September, and so on in proportion to the progress of the season. These are only general data for very bright or strongly illuminated objects, for it often happens that twenty minutes are necessary in the most favorable months, when the objects are entirely in shadow.

After what has just been said, it will readily occur to the reader that it is impossible to specify with precision the exact length of time necessary to obtain photographic designs; practice is the only sure guide and with this advantage, one soon comes to appreciate the required time very correctly. The latitude is of course a fixed element in this calculation. In the south of France, for example, and generally in all those countries in which light has great intensity, as Spain, Italy, &c: we can easily understand that these designs must be obtained with greater promptitude than in more northern regions. It is, however, very important not to exceed the time necessary, in different circumstances, for producing a design, because, in that case, the lights in the drawing will not be clear, but will be blackened by a too prolonged solarization. If, on the contrary, the time has been too short, the sketch will be very vague, and without the proper details.

Supposing that he has failed in a first trial, by withdrawing the tablet too soon, or by leaving it too long exposed, the operator, in either case, should commence with another plate immediately; the second trial, being corrected by the first, almost insures success. It is even useful, in order to acquire experience, to make some essays of this kind.

In this stage of the process, it is the same as for the coating; we must hasten to the next operation. When the plate is withdrawn from the camera, it should immediately be subjected to the subsequent process; there ought not, to be at most a longer interval than an hour between the third and fourth operations; but one is always surest of disengaging the images when no space has been allowed to intervene.

FOURTH OPERATION.

Mercurial or disengaging process.

Here are required:

A phial of mercury, containing at least 3 oz.

A lamp with spirit of wine.

The apparatus represented by Figs. 16, 17, and 18.

A glass funnel with a long neck.

By means of the funnel the mercury is poured into the cup *C* at the bottom of the larger vessel. The quantity must be sufficient to cover the bulb of a thermometer F. Afterwards, and throughout the remaining operations, no light save a taper can be used.

The board with the plate affixed is now to be withdrawn from the frame already described as adapted to the camera, and figured Fig. 13. The board and plate are placed within the ledges of the black iron vessel Fig. 16, at an angle of 45° the tablet with sketch downwards, so that it can be seen through the glass G. The top A is then gently put down, so as not to raise up particles of the mercury.

When all things are thus disposed, the spirit lamp is lighted, and placed under the cup containing mercury. The operation of the lamp is allowed to continue till the thermometer, the bulb of which is covered by the mercury, indicates a temperature of 60° centigrade. The lamp is then immediately withdrawn; if the thermometer has risen rapidly, it will continue to rise without the aid of a lamp, but this elevation ought not to exceed 75° centigrade.

The impress of the image of nature exists upon the plate, but it is invisible. It is not till after the lapse of several minutes that the faint tracery of objects begins to appear, of which the operator assures himself by looking through the glass G, by the light of a taper, using it cautiously that its rays may not fall upon, and injure the nascent images of the sketch. The operation is continued till the thermometer sink to 45° centigrade; the plate is then withdrawn, and this operation completed.

When the objects have been strongly illuminated, or when the action in the camera has been continued rather too long, it happens that this fourth operation is completed before the thermometer has fallen even to 55° centigrade. One may always know this, however, by observing the sketch through the glass

It is necessary after each operation to clean the inside of the apparatus carefully, to remove the slight coating of mercury adhering to it. When the apparatus has to be packed for the purpose of removal, the mercury is withdrawn by the small cock E, inclining the vessel to that side.

One may now examine the sketch by a feeble light in order to be certain that the processes hitherto have succeeded. The plate is now detached from the board, and the little bands of metal which held it there are carefully cleaned with pumice and water after each experiment, a precaution rendered necessary from the coating both of iodine and of mercury which they have acquired. The plate is now deposited in the grooved box (Fig. 9.) until it undergoes the fifth and last operation. This may be deferred if not convenient; for the sketch may now be kept for months in its present state without alteration, provided it be not too frequently inspected by the full daylight.

FIFTH OPERATION.

Fixing the impression.

The object of this final process is to remove from the tablet the coating of iodine, which, continuing to decompose by light would otherwise speedily destroy the design when too long exposed. For this operation the requisites are:

A saturated solution of common salt, or a weak solution of hyposulphite of pure soda.

The apparatus represented Fig. 19, first and second views.

Two square troughs, sheet copper, Fig. 21, both views.

A vessel for distilled water, Fig. 23.

In order to remove the coating of iodine, common salt is put into a bottle with a wide mouth, which is filled one-fourth with salt, and three-fourths with pure water. To dissolve the salt, shake the bottle, and when the whole forms a saturated solution, filter through paper. This solution is prepared in large quantities beforehand, and kept in corked bottles.

Into one of the square troughs, pour the solution, filling it to the height of an inch; into the other pour in like manner the water. The solution of salt may be replaced by one of hyposulphite of soda, which is even preferable, because it removes the iodine entirely, which the saline solution does not always accomplish, especially, when the sketches have been laid aside for some time between the fourth and fifth operations. It does not require to be warmed, and a less quantity is required.

First, the plate is placed in common water, poured into a trough, plunging and withdrawing it immediately—the surface merely requiring to be moistened—then plunge it into the saline solution, which latter would act upon the drawing if not previously hardened by the washing in pure water. To assist the effect of the saline solutions, the plate is moved about in them by means of a little hoop of copper wire, Fig. 22. When the yellow color has quite disappeared, the plate is lifted up with both hands, care being taken not to touch the drawing, and plunged again into the first trough of pure water.

Next, the apparatus, Fig.19, (two views) and the bottle Fig. 23, having been previously prepared, made very clean, and the bottle filled with distilled water, the plate is withdrawn from the trough, and being instantly placed upon the inclined plane, Fig. 19, distilled water, hot, but not boiling, is made to flow in a stream over its whole surface, carrying away every remaining portion of the saline wash.*

Not less than a quart of distilled water is required when the design is of the dimensions indicated in the engraving, 8½ by 6½ inches. The drops of water remaining on the plate must be removed by forcibly blowing upon it, for otherwise in drying they would leave stains on the drawing. Hence also will appear the necessity of using very pure water, for if, in this last washing, the liquid contain an admixture of foreign substances, they will be deposited on the plate, leaving behind numerous and permanent stains. To be assured of the purity of the water, let a drop fall upon a piece of polished metal; evaporate by heat, and if no stain be left the water is pure. Distilled water is always sufficiently pure without this trial.

After this washing the drawing is finished; it remains only to preserve it from the dust and from the vapors that might tarnish the silver. The mercury by the action of which the images are rendered visible, is partially decomposed; it resists washing, by adhesion to the silver, but cannot endure the slightest rubbing.

To preserve the sketches then, place them in squares of strong pasteboard, with a glass over them, and frame the whole in wood. They are thenceforth unalterable even by the sun's light.

In traveling, the collector may preserve his sketches in a box similar to the one Fig. 9, and for greater security may close the joints of the lid† with a collar of paper. It is necessary to state that the same

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* If hyposulphite has been used, the distilled water need not be as so hot as when common salt has been employed.

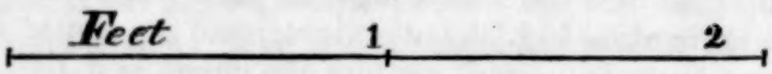
† The author made attempts to preserve his sketches by means of different varnishes obtained from succinum, copal, india rubber, wax, and various resins; but

plate may be employed for several successive trials, provided the silver be not polished through to the copper. But it is very important after each trial to remove the mercury immediately, by using the pumice powder with oil, and changing the cotton frequently during the operation. If this be neglected, the mercury finally adheres to the silver, and fine drawings cannot be obtained if this amalgam be present. They always in this case want firmness, neatness, and vigor of outline and general effect.

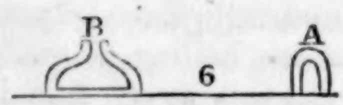
EXPLANATION OF THE APPARATUS USED IN THE PROCESS.

The translator would add from his own experience, that two requisites are indispensable in these experiments: exquisite polish of the plate, and extreme cleanliness in all the operations; dust and stains on the tablet make large blanks in the drawing.

SCALE.



1. 2d view



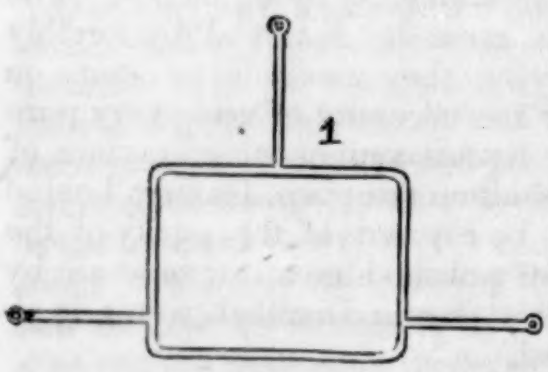
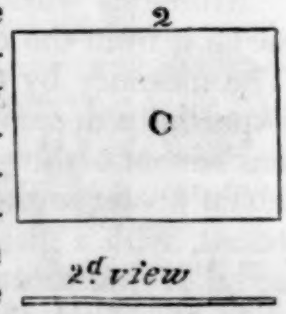


Fig. 1 represents the frame of iron wire for the support of the plate, while undergoing the operation of heating. The first view is the plane seen from above; the second is a section and elevation, shewing the manner in which it is fixed. Fig. 6 B is the spirit lamp applied under the plate; A its stopple.

2



2d view

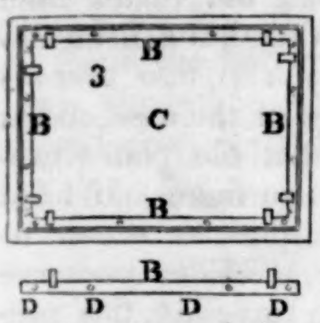
Fig. 2. The plate of plated silver on which the photographic design is made. The dimensions according to the scale are eight and a quarter inches by six inches four tenths. To operate upon plates of larger dimensions requires all the apparatus to be enlarged, for the same camera which admits light sufficient for such a plate has its intensity too much diminished, when a greater focal distance with the

he has observed, that by the application of any varnish whatsoever, the lights in these sketches were considerably weakened, and at the same time the deeper tones were hidden. To this disadvantage, was added the still greater injury from the decomposition of the mercury by all the varnishes tried; this effect, which did not become apparent till after the lapse of two or three months, terminated in a total destruction of the forms of the objects represented. Even had this not been the case, the author would have deemed it a sufficient reason for rejecting all varnishes, that they injured the vigor and clearness of the lights. The quality most to be desired in the new art is this intensity of tone in the contrast of the lights and shadows.

same aperture, and consequently same number of rays, spread over a larger surface. In polishing the plate, begin at C, and strike circularly outwards to the circumference. Vary the direction, however, and

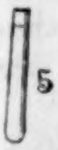
invert the process. Always press lightly and evenly. Fig. 2, second view, is the plate seen edgeways: the lines represent (nearly) its thickness. Fig 4, muslin bag, with pumice powder.

Fig. 3. The little board or wooden tablet upon which the plate is fixed for the succeeding operations after the first one of polishing. It



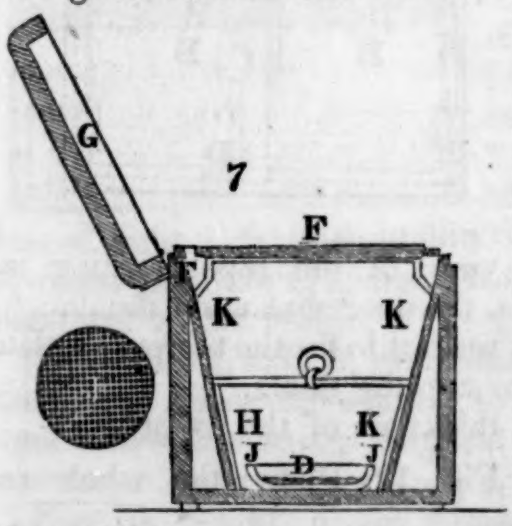
is attached by means of four fillets, B B B B, exactly the same material as the plate itself. To each of these are soldered two small projecting pieces, which embrace the plate near the corners, and the whole apparatus is retained in position by small nails, or better, screws through holes in the fillets, and inserted by the handle or turn screw, Fig. 5. The purpose of the fillets is not solely to fix the plate, their more important use is to serve as a kind of frame to it, while undergoing the second process; the application of the iodine: without these, the cooling of iodine would not be equally diffused, for the vapor would condense

2d view

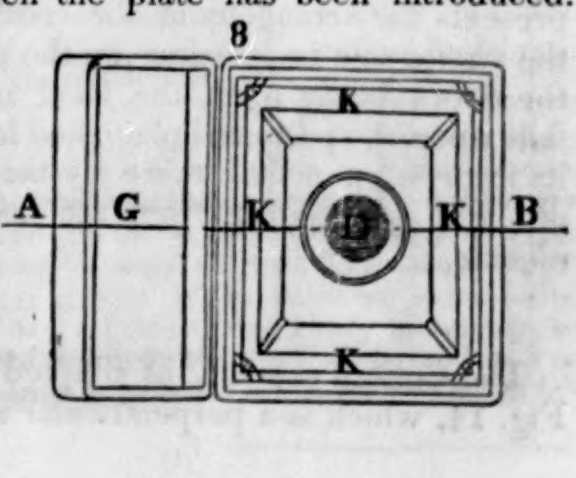


more rapidly along the edges, and consequently, the coating would be too thin in the centre and too thick round the circumference. It is perhaps not easy to explain so as to satisfy all; but the experimental part is not the less certain. Fig. 3, second view, thickness of the board.

Fig. 7. Section of the box for iodine, used in the second operation.



The section is supposed to pass down the middle of the apparatus by the line A B, Fig. 8, which represents the same seen from above. C is a small lid, which fits accurately the interior, dividing the whole into two chambers. It is used at all times, except when the operator is actually employed in coating the tablet. Its use is to concentrate the vapor of the iodine, and preserve the whole in a state for equally and rapidly diffusing the vapor, when the plate has been introduced.



D is the capsule or little cup in which the iodine is placed. E the small board with the plate attached, face downwards. Four small projecting supports, F, receive the four angles and retain the plate in the most favorable position for receiving the vaporization of the iodine as it rises upwards. Of course the cover C is withdrawn. G is the

box lid, always shut, except when the plate is to be withdrawn for examination. H supports for C. K, tapering sides all round, forming a funnel-shaped box within the other; the funnel-shaped interior diffuses the vapors of iodine, which thus spread as they rise. J, circle of gauze, stretched over a ring, and placed upon the cup with the iodine. The vapor of which rising through this light covering flows up equally, and not in clouds, also the gauze prevents the particles of this substance from flying about and probably injuring the plate.

9

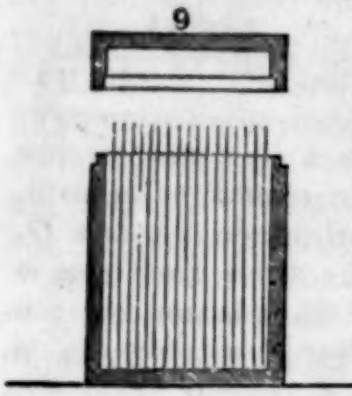
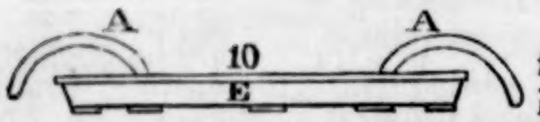
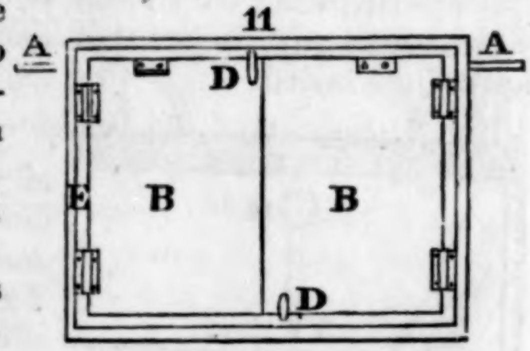


Fig. 9. Case for preserving the plates from injury, either before or after they have been impressed with images. They slip into grooves formed into two opposite sides of the case, and at some little distance apart, so that the plates cannot touch in any part of their surfaces. If filled with plates, that have designs, the case should be wrapped in paper, or better, cloth, to preserve them from dust and light. In traveling, this precaution is always necessary.



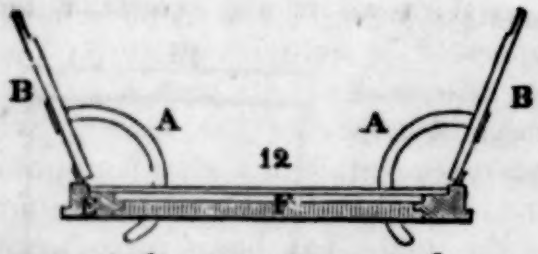
Figs. 10, 11, 12, and 13, represent four different positions of the frame into which the plate with its wooden tablet is put, on removal from the iodine process. The object of the apparatus is twofold:—to adapt the plate to the camera obscura, and to protect the iodine coating from the action of light to the moment in which it receives the focal image.

11



A, Half circles which open and shut the doors, B B.

C, Fig. 13. The plate with its wooden tablet fitted into the frame: back view of the *plate* fronting inwards, the door shut upon it.

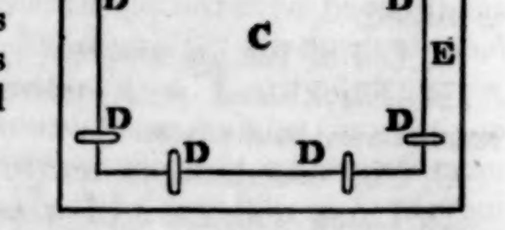


D, screws to fix the tablet and plate and to stop the doors.

E, thickness of the frame.

F, Fig. 12. Plate: the whole represents the arrangement for receiving the photogenic impressions on the plate, the doors being open, the focal image falls upon the prepared plate, and leaves its impress penciled there by the rays of light proceeding from the natural objects.

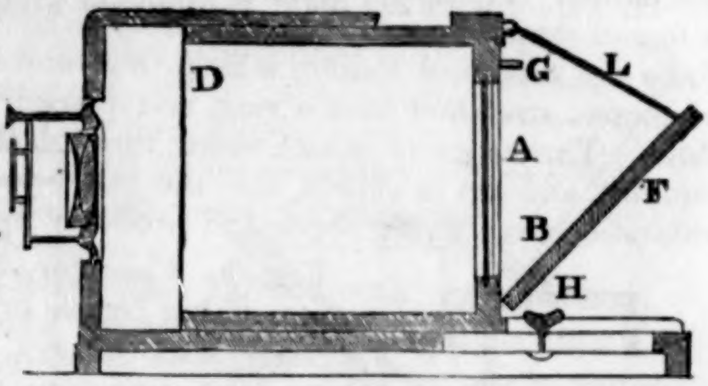
13



The camera obscura, as adapted to photogenic delineation is shown Fig. 14, which is a perpendicular section lengthways.

A, a ground glass by which the focus is adjusted. It is then removed, and the photographic plate substituted, as in C, Fig. 15. B, a mirror for observing the effect of objects, and selecting points of view. For these purposes it is inclined at an angle of 45°, by means of the support L. To adjust the focus, the mirror is put down altogether, and the ground glass A used. The focus is easily adjusted by means of the sliding frame, as represented in the plate, placing the screws on the double box D, and the projection E: when the focus is adjusted, it is fixed in position by the screw H. The mirror is retained in its place by hooks at F, which catch the eyes at G.

14



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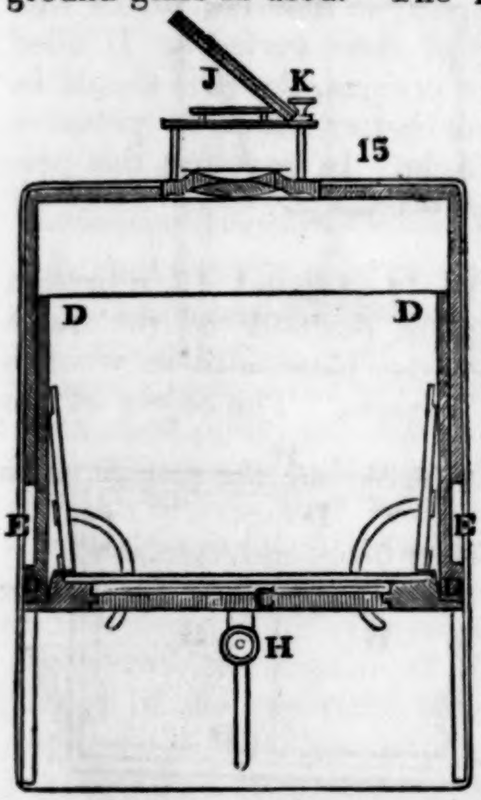


The object glass is achromatic and periscopic. Its diameter is 21 millimetres, and its focal distance 38 centimetres. In Eng. measure, $\frac{21 \times 38}{1900}$ in. and $\frac{38 \times 39}{100}$ in. which can easily be reduced.

This instrument has the disadvantage of reversing the objects. This can indeed be easily obviated by substituting another mirror outside, as K J, Fig 15. This arrangement, however, injures the effect on the photographic plate from the loss of light. It is therefore not to be employed unless when the operator has time to spare. It increases the time of the operation by one-third of the whole.

Figs. 16, 17, and 18 represent three views of the same apparatus—that used for the fourth operation—submitting the plate to the vapor of mercury.

Fig. 16. Section of the apparatus.

Fig. 17. Front view of the same.

Fig. 18. Right side in which the thermometer is placed.

A, Lid of the apparatus.

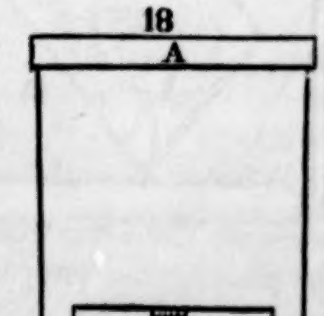
B, Blackboard with grooves to receive the small board and plate.

C, Cup containing mercury.

D, Lamp with spirit of wine.

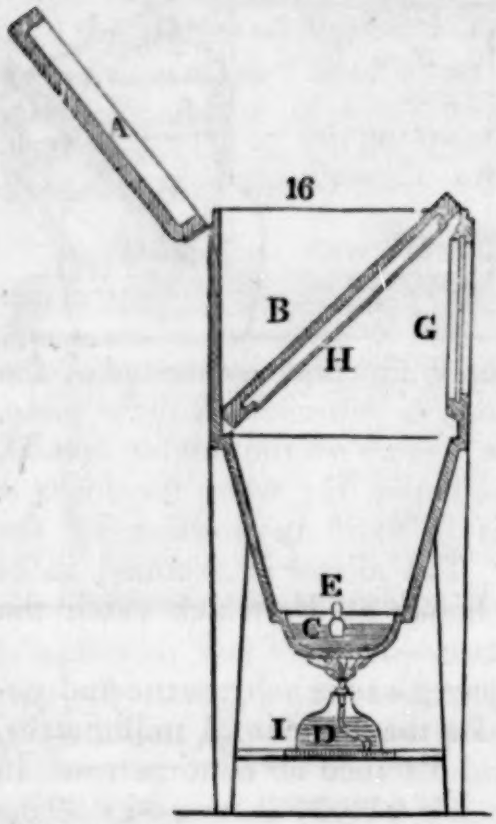
E, Small cock inserted at an angle, through which the mercury is withdrawn after the operation.

18



F, Thermometer.
G, Glass through which to inspect the operation.
H, Tablet with the plate as removed from the camera.

16



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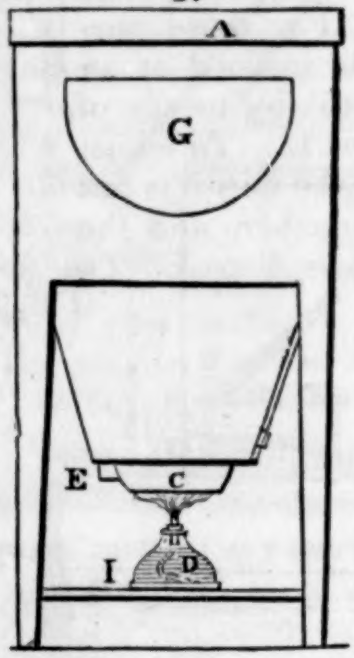
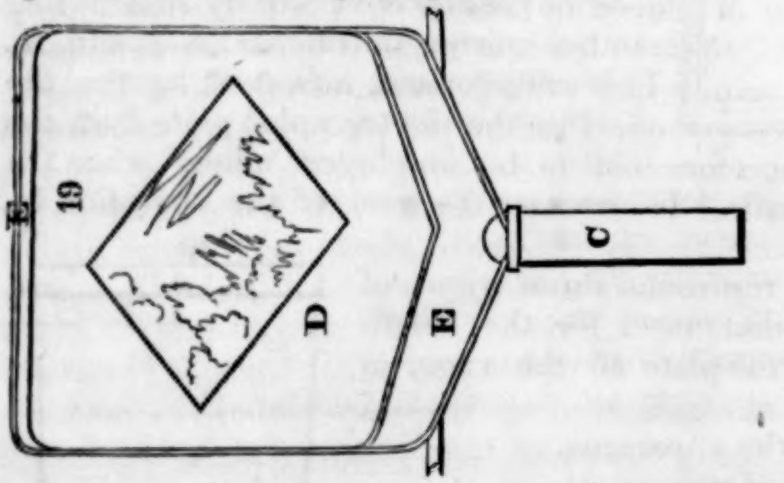


I, Stand for the spirit lamp which is placed within the ring N, so as be under the centre of the cup.

All the interior of this apparatus shóuld be black and varnished.

Figs. 19, 20, 21, 22 and 23, represent various apparatus for the last operation of washing the plate.

19



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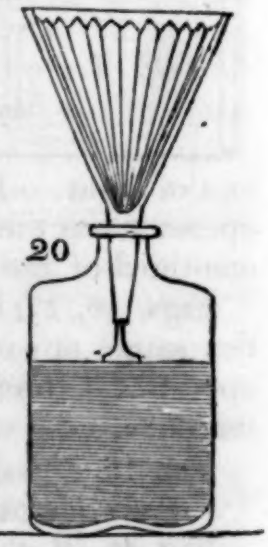

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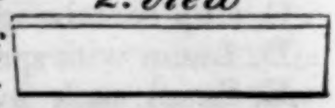
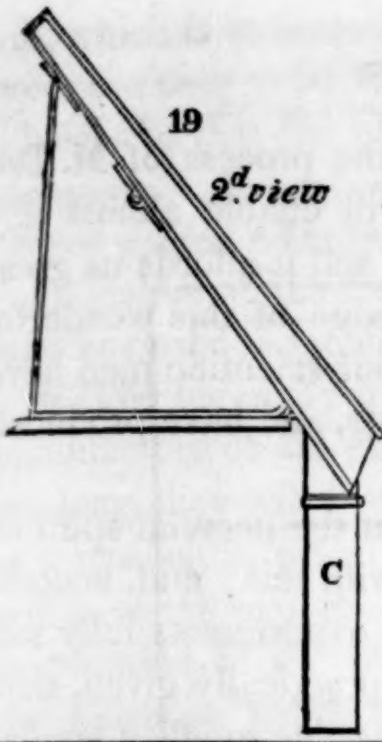


2d view

Fig. 20. Funnel with plate of paper for purifying the saline wash of salt or hyposulphite of soda.

Fig. 21. Trough of tinned copper, in the bottom of which is represented one of the plates in the act of being washed. Two such troughs must be prepared



one for salt—the other for distilled water.

Fig. 22. Little hook for shaking the plate while in the wash.

Fig. 19. Apparatus in japanned white iron for washing the designs.

E, well for receiving the water that flows through the tube C.

Fig. 23. Bottle with wide mouth serving to warm the distilled water and to pour it upon the plate when placed as at B, Fig. 19.

IMPROVEMENTS IN THE DAGUERREOTYPE.—At the late meetings of the Academy of Sciences, much attention has been given to the various improvements made in the Daguerreotype, which instrument seems to have attracted the very active notice of scientific men in general. In the first place, the Baron Seguier exhibited an instrument of this kind constructed by himself, but with ingenious modifications, having for their objects, diminution in size and weight, and the simplification in other respects of the entire apparatus. M. Seguier expressed himself satisfied that several of the conditions, which have been announced as required for the success of the process, may be dispensed with; and stated his intention of devoting himself to a still further simplification of the apparatus, so as, at least, to make it more portable, more easy of use, and less expensive. His improvements have likewise been directed to rendering the operations of photography practicable in the open country, even those delicate ones, which seem at present to require protection against too strong a light. M. Arago afterwards laid before the academicians an objective glass, constructed by M. Cauche, with the view of *redressing* the image obtained in the Daguerreotype, which is now presented *reversed*, a circumstance that, in many cases, destroys the resemblance of places and monuments. The Abbé Moignat gave an account of experiments made by himself, in conjunction with M. Soleil, for the purpose of introducing the light of oxy-hydrogen gas, as the principle of illumination to the objects intended to be represented by the instrument. As yet, these experiments have been unsuccessful; but M. Arago does not consider the results hitherto obtained as decisive against the light in question, when applied to the plate itself, instead of the objects to be rendered. A report has also been made on the results of a process, by which M. Bayard is enabled to take impressions on paper. This discovery is described as important; but, as the process is kept secret, we are unable to say how far it differs from, or is an improvement on, that of Mr. Fox Talbot. Athenæum.

OBSERVATIONS.

The preceding pages describe fully the process of M. Daguerre—a strict adherence to which will enable almost any person to produce beautiful specimens; and it affords us great pleasure to state that, since the knowledge of this wonderful discovery reached this country, some of our scientific men have been engaged in repeating the experiments, and have produced some good results.

It could not, however, be supposed that the peculiar spirit of American enterprise would rest satisfied with this; and, accordingly, no sooner had those engaged in the experiments fully satisfied themselves that the process was practically given, than they almost immediately conceived it possible to effect similar results by more simple and less expensive means; and we are happy to state that the results of their experiments have established the following facts, viz:—

1. That instead of the costly combination of glasses, recommended by M. Daguerre, a single Meniscus glass has produced as exact and brilliant results as we have yet seen, and requires less time.

2. From a number of experiments it has been proved, that the use of dilute nitric acid can be dispensed with, as several fine proofs have been produced without its use. This renders the process much more simple; for the application of the acid has heretofore been considered one of the nicest points in the preparation of the plate, as, if it be unequally applied, it prevents the plate from acquiring the uniform golden color when exposed in the iodine box. In dispensing with the use of nitric acid, all that is required is to finish the polish of the plate, with dry, well levigated, and washed rotten stone; after which, the plate should be carefully rubbed off with dry cotton.

3. The iodine box, recommended by M. Daguerre, is entirely too deep, for it requires from 15 to 30 minutes exposure of the plate before the proper color is produced. The box should be about four inches deep, with a tray, an inch deep, that will fit into the bottom of it. Upon this tray the iodine is to be spread, and then covered with a double thickness of fine gauze, or vel-

vet, which is to be tacked to the upper edge of the tray; supports are then to be fastened in each corner of the box, at such a height as that the plate can be lowered to within an inch of the gauze. A box constructed on this plan will produce the proper golden color, on the plate, in one or two minutes. This modification of the iodine box was suggested by Mr. Seager, who has used it satisfactorily for some time past.

4. The ingenuity displayed by some of our mechanics in the manufacture of the plates, gives us every reason to believe that, ere long, they will be furnished with almost the requisite polish, at a reasonable price. Should they succeed in doing this, it will save the experimenter several hours of manual labor, in the preparation of the plate, as nothing then will be required but the finishing polish, with prepared rotten stone, mentioned above.

TABLE OF GENERAL RULES FOR EXPOSURE OF THE PLATE IN THE CAMERA, IN TAKING EXTERIOR VIEWS.

The following table is compiled partly from observation, and partly from analogy, and applies only to the period from the month of October to February. The observations were made upon ordinary city views.

STATE OF THE WEATHER.	HOURS OF THE DAY.						
	8	9	10	11 to 1	1 to 2	2 to 3	3 and after
	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.	MINUTES.
Very brilliant and clear, wind steady from W. or N. W., very deep blue sky, and absence of red rays at sunrise or sunset. Time employed....................	15	8	6	5	6	7	12 to 30
Clear, wind from S. W., moderately cold, but a slight perceptible vapor in comparison with above. Time employed.............	16	12	7	6	7	8	15 to 40
Sunshine, but rather hazy, shadows not hard, nor clearly defined. Time employed..................	25	18	14	12	14	16	25 to 40
Sun always obscured by light clouds, but lower atmosphere, clear from haze and vapor. Time employed.	30	20	18	16	15	20	35 to 50
Quite cloudy, but lower atmosphere, free from vapors. Time employed..................	50	30	25	20	20	30	50 to 70

It is impossible, at present, to state precisely the time required

to expose the plate in the camera at all seasons of the year; but the preceding table, drawn up by Mr. D. W. Seager, of this city, and which coincides in general with the observations of others, may prove useful as a guide to experimenters. The time will necessarily decrease as the summer months approach. Much, however, depends upon the selection of the view; a white marble edifice, for instance, requires less time than darker buildings. ED.

THE DAGUERREOTYPE. M. Jobard, who forwarded to the exhibition the first view, taken in Belgium, with the Daguerreotype, has just exhibited the *first portrait* taken from the life. It represents a young female dressed in white, sleeping under a canopy; the material and embroidery of the pillows on which she reclines are rendered with exquisite nicety, as well as the hand and the side of the face on which the *light* rests. This proves that small *tableaux de genre* in the style of Deveria, might be produced by the machine, which could not fail to possess some beauty. One precaution, however, would be necessary, *not to drown the figures in a flood of light.*

RIVAL TO THE DAGUERREOTYPE. If we believe the German papers, one Leipmann, of Berlin, has invented a machine for obtaining correct copies of oil colored pictures. For some years a little slender man, whose dress denoted poverty, was observed in the museum of Berlin, every week, stationed before a portrait of Rembrandt, with his eyes fixed upon the picture. It was M. Leipmann, meditating upon the invention of a machine for reproducing oil paintings; and, after ten years of persevering labor, he has succeeded. He has produced with his machine in one of the rooms of the Royal Museum, and in presence of the directors, one hundred and ten copies of Rembrandt's portrait, painted by himself, a picture, the copying of which in the usual way presents the utmost difficulties. The copies are said to be perfect, and to give the most delicate shades of the color. He asks but a louis d'or for a copy. Bury Post.

The King of Prussia has honored Leipmann with the following communication on that ingenious artist's submitting to his Majesty a specimen of his invention for the copying of oil paintings:

"I have not only heard for some time past of your invention for the printing of oil paintings, but have also convinced myself of its importance by the copy of Rembrandt's portrait, which you have submitted to me. I expect a more circumstantial report upon your invention from the minister of public instruction; but, in the meantime, I have ordered two hundred dollars to be presented to you, in acknowledgment of your merit, and shall with pleasure keep the copy you have submitted to my inspection. (Signed)

Berlin, Sept. 10, 1839. FREDERICK WILLIAM.

Effects of light on color. Mr. Trull exhibited certain tapestries of Raffaelle, in the Haymarket, some time ago. Mr. Professor Faraday, suggested that the application of sunlight would restore the colors and the prophecy has been fulfilled to a miracle. 'A renewed freshness,' says Mr. Trull, 'now reigns over the whole, and the clearing up of the light in many of the landscape parts is most extraordinary, giving a depth and breadth the cartoons themselves do not now convey; particularly in the 'Keys to St. Peter,' 'St. Paul at Athens,' and 'the death of Annanias, where extensive landscapes, ranges of buildings, and foliage, have sprung up like magic on parts quite obscured when up in London, eight months back, much of which is either worn or torn out of Raphael's patterns at Hampton, and painted over, and known only through the means of these Leo Tapestries.' And again: 'Some colors entirely changed, others in confusion and apparently gone, yet by the mere effects of light and air, slowly and quietly resume the principal of their original tints! Flesh re-appears, hair on the head starts up: the grand muscular effect and unique power of expression, only found in Raphael and Michael Angelo, are finely developed, where a few months back appeared a plain surface! Here are the works, and the facts may be now ascertained.'

The typoface. The Bordeaux papers mention that a young sculptor of that city had discovered a method of taking casts of the human face, which, without requiring that the features should be reduced to a state of perfect rigidity, allows them to preserve all their natural play, and thus produces an exact resemblance, with the animation of life. His name is Pellet, and he designates his apparatus the *Typoface.*

Thorwaldsen. This great sculptor, who has recently completed some mythological bas-reliefs, is at present occupied with a bust of Holberg, and when that is finished, will undertake, for the Baroness Stampe, a statue of himself in marble. The sculptor is now residing at the beautiful estate of that lady, where she has built an *atelier* for his use. He has lately visited Hamburg, and made many short excursions in the neighborhood, which have resembled a continued triumph. Wherever he went he was received with processions, speeches, and all the usual manifestations of respect and pleasure; peasants, it is said, came many miles to see him, and landlords refused to accept payment for the refreshment furnished on these occasions; a proof how far his popularity has extended among the people, however imperfectly the grounds on which it rests may be understood. Atheneum.

Sir David Wilkie. We understand that Sir David Wilkie, during his late northern tour, spent some time at Arbuthnott House, where he was engaged in taking a full length picture of Viscount Arbuthnott. This work of art, which has been subscribed for by the landed proprietors and tenantry of the county of Kincardine, of which his lordship is Lord Lieutenant, will adorn the County Hall at Stonehaven.

STEAM AND ITS APPLICATIONS.

Steam Carriage for common roads. An experimental trip was made in Mr. Hancock's steam carriage as far as the eight mile stone on the Barnet road, under the patronage of Sir James Gardiner, and several gentlemen connected with, and interested in, scientific matters. The start took place at eleven o'clock from Finsbury square, and for a considerable portion of the distance affairs proceeded as well as could be desired. Eventually, however, it was discovered that part of the machinery was out of order, in consequence of the patentee, from pressure of business, as it was stated, not having taken the necessary preliminary precaution of overhauling the whole of its intricate works. The experiment, therefore, as to its first intention, proved a failure. The defect, nevertheless, was, to an extent, remedied, and the return to London accomplished within a very short space of time. Notwithstanding the comparative failure in the object of the day, it is but just to the inventor to declare, that the obstacles which a large portion of the scientific world had asserted to be insurmountable by means of a locomotive power on the road, namely, the ascent of hills or the obtaining a controlling command in making a descent, was by Mr. Hancock, on the occasion, proved to be visionary. The rate made going up the the Highgate Archway, and other hills, was nearer seven than six miles in the hour, whilst that in descending was regulated at the will and pleasure of the conductor. Standard

We are happy to state that since the above experiment Mr. Hancock has succeeded in performing the trip from London to Cambridge in four hours and a half-distance 52 miles. Ed.

Improvement in Steam Engines. At the port of Toulon, preparations are being made for trying an important modification of the crank of steam engines for vessels, suggested by a naval officer. This modification consists in rendering the cranks fixed, or moveable at pleasure, by means of a curb *(freni)* similar to those employed for trying the power of the engines. If the experiment, which is to be tried on the Styx, succeed, the paddle wheel will become, at will, independent of the engines, without the necessity for employing a complication of machinery, which hitherto has been more ingenious than useful.

Inventors' Advocate.

Steam Power in Birmingham. The steam power employed in Birmingham is, at the present time, 3436 horses' power, of which 2155 horses' power is employed in the metal trade of the town. The number of steam engines is 240, of which sixty-five are high pressure, and the remainder condensing engines. In the first thirty five years after the introduction of steam power, only forty-two engines were set to work; in the next fifteen years, seventy-eight were erected; and in the last eight years one hundred and twenty have been established. The consumption of coal is estimated at two hundred and forty tons per day. Scotsman.

Steam Power in France. The Commerce has a long and interesting article upon steam power in France, from which the following is extracted.

In 1820, the number of stationary steam engines in France was only 60, of 1024 horse power collectively; from 1820 to 1830 very few new engines were added annually; but in 1833 there was an addition of 156; in 1834, 199; in 1835, 262; in 1836, 324; and in 1837, 234. At the end of 1837 the total number of stationary steam engines in France was 1969, with a collective power of 26,186 horses; of this number 555 were employed in cotton factories, 118 in forges and foundries, and the rest in sugar refineries and establishments of different kinds; of these engines about three fourths were high or mean pressure, these being preferred in France on account of the high price of coals, a high pressure engine consuming about 8lbs. of coals per horse and per hour, and a low pressure engine 10lbs. Seven eighths of the engines were of French manufacture. The number of engines in French steamboats at the end of 1837 was one hundred and fifty in one hundred and twenty-four boats. The greatest power on board of any boat was one hundred and eighty horse power—two engines of ninety each; but the Neptune and the Rotterdam, of Havre, the one a towing and the other a passage boat, had each an engine of one hundred and forty horse power. Seventy-nine of these steamers were employed as passage boats, twenty-two for passengers and merchandise, and thirty-three as tow boats and transports The total amount of power in the one hundred and twenty-four steamers was 5,408 horses. On railways the locomotive engines amounted to twenty in the departments of the Loire and the Rhone, and twenty-seven in the Seine; giving altogether 1210 horse power. At first all the locomotives were of English manufacture, but latterly two thirds are French. The total steam movement in France up to 1838, was:

Stationary engines	1969	horse power	26,127
Steamers	150	"	5,408
Locomotives	47	"	1,210
	2,166		32,745

Since 1837, a great many large engines have been made for government steamers, and the locomotives for railways must have been doubled in number; but in consequence of the distressed state of trade, the number of stationary engines has not increased in so large a proportion as before. The Commerce, whilst it admits that until lately the steam engines made in France were not equal to the English, contends that they are now quite as good; but the best proof to the contrary is, that the repairs of the French low-pressure engines cost twice as much as those of the English. As to the high pressure, the repairs are so expensive as to be almost equivalent to the saving of coals.

The Anthracite Steam Vessel.—It has been considered an object of much importance to bring into use the extensive field of coal which exists in South Wales, known by the name of the "anthracite or stone coal." This has been, hitherto, only partially used, and for some very inconsiderable purposes, such as the burning of lime, malting, and, in some few isolated instances, for steam engines in Wales and in Corn

wall; but, within the last few years, a number of attempts have been made to use it in the manufacture of iron. These were, at length, successfully carried into effect at Mr. Crane's works, at Ynischedwyn, by Mr. E. Manby, and since then, he has formed several establishments where iron of a very superior quality has been made. These results have induced a party of gentlemen, who are interested in the mineral districts, to form a company for extending the use of this fuel. They have caused an iron vessel to be built by Mr. Penn, of Greenwich, on the exact model of the iron boats now plying on the Thames, and have applied the same power of engines, and restricted them to the same external dimensions of boiler, as in the usual vessels. To this they have adapted the improvements patented by Mr. Player, and executed under the joint directions of that gentleman and Mr. Manby. This vessel has been running, for the last few days, on the Thames, and yesterday we had the satisfaction of witnessing her complete success, as far as demonstrating the power of raising steam by this fuel, which has hitherto been objected to from its slow combustion, arising from its not containing any bitumen. The dimensions of the vessel are about ninety-five feet long, thirteen feet six inches breadth of beam with a draught of water of two feet. The engines are of the power of twenty-four horses collectively. They are on the principle of the vibrating cylinder, and, *en passant*, we would commend them for their smooth action; and, being fixed to a strong frame which is nearly isolated from the vessel, there is an absence of that tremulous motion which, in general, is so annoying in steam vessels. The principle of the boilers is, to prepare the fuel for combustion by passing it through a hopper which traverses the boiler, and, falling upon the centre of the fire, keeps it continually supplied with the coal partially charred, so as to prevent the decrepitation which has hitherto prevented, in many instances, the use of this fuel. The hopper is kept filled from the level to the top of the boiler, and thus avoids the scorching labor of the poor stokers, whose melting toil we have so often lamented. During the day voyages, the fire-doors in the engine-room were never opened except to examine the working of the principle, and the supply of steam was, in spite of the smallness of the boiler, ample for the engines. The speed attained, when once clear of the incumbrances of the Pool, was from eleven to twelve miles per hour; and, in a longer voyage, when the engines had got their bearing, this speed may well be reckoned upon. The great distinguishing mark of the Anthracite, which is the appropriate name of the vessel, is the total absence of the pennon of black smoke vomited forth from the chimney of the ordinary steamers, to the annoyance of the frequenters of the river and the inhabitants of its banks. **Morning Post.**

Anthracite coals have been used in this country, for some years, with the greatest success, both for steam boats and locomotive engines. The Baltimore and Washington railroad company were the first to introduce its use for locomotives. We do not know of any stationary engine in this city, in which other fuel is used. ED.

The capital invested in steam vessels in England, is about £8,000,-000. The steamers belonging to Britain amount to 850 or 900, comprising about 170,000 tons, and 70,000 horses' power.

Power of Steam.—The greatest load lifted by any engine now at work in this country was by one in the consolidated mines, which raised a load of 90,000 lbs. every double stroke it made, and did this nine times a minute, amounting to 567,022 tons, lifted 7 ft. 6 in. in 24 hours; and this astonishing machine could be started, stopped, or regulated by a little boy. Mechanics' Magazine.

Large deductions should probably be made from the published statements of work performed by the Cornish engines. The usual method of calculation is to give the contents of the pump barrels as *full*, for each stroke, and by calculating the weight of water, decide the load raised. It is well known that a quantity of atmospheric air, but not sufficient to destroy the vacuum is admitted into the pump barrel at each stroke, for the purpose of preventing the large pistons from striking the water too harshly; and no allowance appears to have been made for the space it occupies. Ed.

Steam towing on Canals.—The recent important improvements, which have been made on this subject, upon the suggestion and under the direction of Mr. Macneill, C. E. were again repeated by him on the Forth and Clyde Canal, on the 10th and 11th instant. On the latter day they were carried on upon a more extended scale, in the presence of the governor, deputy governor, council, manager, and a great many of the proprietors of the company, several of whom had come from London, Liverpool, &c. expressly for the purpose. Besides these gentlemen, there was a large number of persons assembled, anxious to witness this harvest of new facts, pregnant with important consequences to the commerce of the country, and so deeply interesting in a scientific point of view. The locomotive employed was the *Victoria*, the same engine that had been used in the former trials. By her were towed both the passenger boats, and the larger vessels of the canal trade, under a variety of conditions. Some of the most remarkable results were as follows:

With a passenger boat laden with passengers (an average load,) a rate of twenty miles per hour was attained, and it was evident that the only limit to the speed was that of the power of the engine. The following eight trading vessels were arranged in a line, attached to each other and the first to the locomotive:

	Tons register.	Actual load. Tons.	Draught of water,
Thetis, Grangemouth	66	35	8 ft. 0 in.
Alert, Leith	41	67	8 9
Union, Kirkaldy	48	65	8 6
Carried forward,	155	167	

	Tons register.	Actual load. Tons.	Draught of water.	
Brought forward,	155	167	24 ft.	15 in.
Thistle, Alloa	51	18	6	0
Dainty Davy	30	47	7	10
London Packet	81	70	8	10
Star (Scow)	0	40	4	0
Prince (luggage boat)	0	22	4	6
	317	364		

For the haulage of this amount of tonnage, at the usual rate of one mile and a half per hour, about twenty horses are employed under the most favorable circumstances. The *Victoria* towed it with about one-fourth only of her steam power at the rate of two miles and a quarter per hour. The ease with which she did this justified the opinion of several spectators, qualified to judge, that double this amount of tonnage might have been mastered by her with very little or no diminution of her speed. The wave produced by motion of the large vessels at the rate they were towed was of the ordinary size and character; that of the rapid boats, though large, was by no means so formidable as to create any fear that it would be any obstacle to the adoption of this mode of conveyance. In one of the latter experiments, four passenger boats were towed in a line, and the volume of the waves was evidently broken up into numberless smaller waves, spreading over the whole surface of the canal, and resembling a great ripple. The reverse of this occurred when two passenger boats were lashed together abreast as a twin boat; the wave then extended in a fine regular glassy swell from the boats to the shores. These effects point out the fact, that the form, magnitude, position, &c. of the wave are all susceptible of modification. As little is to be apprehended from curves, of whatever character. In the railway upon which the engine travelled there was a curve of double flexure, the radius of part of which was less than a third of a mile. No sensible retardation in her speed was produced by it, nor was any disposition observed, even in the most rapid transits, to run off the rails. To prevent the latter effect occurring from the resistance of the vessels towed, the outer rail was laid a little lower in level than the inner one, so as to give the engine a slight tendency to descend towards the outward rails. This also prevents, in a certain degree, the overturning of the engine by a strong pull. During the whole of the several series of experiments, not a single fact occurred to check the expectation that this union of the railway and the canal will, wherever practicable, take the precedence of every other, in point of convenience, safety, rapidity, and economy. Glasgow Chronicle.

We hope the New-York and Erie Railroad Co. will investigate this subject fairly, before deciding upon a route distant from the canal. Ed.

The "Archimedes" Steamer.—On Monday morning the three-masted steam-schooner the *Archimedes*, fitted up anew for the purpose of demonstrating the advantages of the Archimedes screw as a propeller,

proceeded down the river from London Bridge, on an experimental trip. The weather was most favorable, and a great number of amateurs, scientific and practical, availed themselves of the liberal invitation of the proprietors to witness the progress, nay, we may now confidently say, the success of the invention. The vessel started at a quarter past eleven, amidst the huzzas of the watermen, overjoyed to witness the advent of a steamer that raised no waves for their annoyance, and, indeed, scarcely left more disturbance in her wake than a sailing vessel. At Purfleet the speed of the vessel was accurately tried while passing the "measured mile" marked out by order of the Admiralty on the southern coast. Against wind and tide the *Archimedes* performed the mile in nine minutes five seconds. Turned round (which was done with the greatest facility, and in a very small circle,) and steaming up the river, with wind and tide, the same mile was performed in four minutes and a half. A third experiment down the river, against wind and tide, required nine minutes and fifty-two seconds. The engine was during these trials making between 22 and 23 strokes per minute, being $5\frac{1}{2}$ revolutions of the propelling screw, working in the "dead wood" of the vessel, immediately in front of the stern-post. The log, thrown at the turn of the tide, indicated a rate of nine knots. The most unqualified satisfaction was expressed by all on board at this performance, considering that the *Archimedes* has been fitted up as a sea-going vessel, drawing $10\frac{1}{2}$ feet, and not intended to exhibit in competition with sharp and shallow river craft. Even on this experimental trip the rigging was decidedly an obstacle when the wind was ahead, for no sails were set, though the vessel is fully calculated to proceed with them alone, if needful. The engines were much admired, and Massie's pumps which (strange yet true) cannot be choked! excited considerable attention, both by the quantity of water they could elevate, and the ease with which they could be worked. Still further improvements are in progress, by one of which (in the shape of the stem itself) Mr. Smith, the inventor, expects to be able to realize two additional miles per hour. Bristol Mercury, Oct. 10.

It will be seen that the average speed, as above, is a mile in 6 minutes, $47\frac{1}{2}$ seconds, or $8\frac{17}{20}$ miles per hour. A similar boat is now in operation on the Delaware. ED.

The Archimedes Steamer.—Another experimental trip was made by this vessel on Wednesday, in presence of a number of distinguished naval officers and engineers. On starting from London Bridge, which was crowded with spectators, the Pool was much encumbered with vessels, in navigating through which, at considerable speed, the facility of steering was well demonstrated, and the absence of the paddle boxes was evidently of much advantage, as, in spite of the usual bustle, no accident occurred. On getting clear of the Pool, the engines made 22 revolutions per minute, and the speed of the vessel by the log was $7\frac{1}{2}$ knots, which, at Woolwich, was increased to $9\frac{1}{2}$ knots, with the tide and the wind on the starboard quarter. This speed was maintained to Greenhithe, when it was determined to try the vessel under canvass as well as steam. All the sails were set, and after proceeding

to Gravesend, where the British Queen was met, steaming up in all her majesty, the Archimedes turned and started for London, having the tide and wind in her favor. The distance from Gravesend to Blackwall was accomplished in two hours, which would give a speed of nearly thirteen miles an hour. Among the numerous visiters on board were noticed Sir Edward Parry, Sir William Symonds, Col. Acklom; Captains Basil Hall, Austin, and Smith, R. N.; Messrs. D'Este, P. Ewart, C. E., Miller, C E., and Manby, C. E., all of whom appeared to pay minute attention to the action of the machinery. Bristol Mercury.

Power of Steam.—A pint of water evaporated by two ounces of coals, swells into 216 gallons of steam, with a mechanical force sufficient to raise 37 tons a foot high; and, by allowing it to expand, by virtue of its elasticity, a further mechanical force may be obtained at least equal in amount to the former. The circumstances under which the steam-engine is worked on a railway are not favorable to the economy of fuel: nevertheless, a pound of coke, burnt in a locomotive engine, will exert a mechanical force sufficient to draw two tons weight a distance of one mile in two minutes. Four horses, working in a stage coach, on a common road, are necessary to draw the same weight, the same distance, in six minutes. A train of coaches, weighing about eighty tons, and transporting 240 passengers, with their luggage, has been taken from Liverpool to Birmingham and back, the trip each way taking about four hours and a quarter, stoppages included. This double journey of 190 miles is effected by the combustion of a quarter of a ton of coke, the value of which is six shillings. To carry the same number of passengers, daily, between the same places, by stage coaches, on a common road, would require twenty coaches, and an establishment of *three thousand eight hundred horses*, with which the journey in each direction would be performed in about twelve hours, stoppages included. Lardner on the Steam Engine

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Hail, wonder-working Steam!—Thanks to the improvement of navigation and the roads, London is now within twenty-one hours of Dublin; Ireland is nearer the English parliament than Scotland or Wales. How strange! England is now nearer to the United States of America, though they are three thousand miles distant, than she was to Ireland half a century ago, though Ireland is separated from her only by a narrow strait. These wondrous creations of human science, which are destined to change the social relations, not only of men but of nations, will exercise their first influence on Ireland, for the route between London and Dublin is the first great distance by land and sea which has been greatly diminished by steam.

De Beaumont's "Ireland," edited by Dr. Taylor.

The Steam Engine, &c. familiarly explained.—London: Taylor and Walton.—Dr. Lardner has just issued the *seventh* edition of the above work, which treats of the steam engine, steam navigation, and railways, and which is intended as an "easy and useful introduction to steam engineering, for all those who are interested in the arts and manufactures." The progress which this wonderful invention has made since the first machine contrived by Hiero of Alexandria, 120

years before the Christian era, "which was moved by the mechanical force of the vapor of water," is distinctly traced to the period when the memorable discoveries of James Watt gave usefulness and national importance to the invention. It would be easy to enumerate the benefits which have accrued from the practical effects of steam; these will be familiar to every reader of our columns; we therefore only observe, that civilization has been advanced by its power; comfort has been promoted by its means; liberty has been strengthened by its range; and the transit of men and merchandize over land and across seas, has been increased in a ratio which defies all calculation. The work will be illustrated and explained by wood engravings.

Novel Steam Apparatus.—There is in the Oxford Union workhouse a steam apparatus by means of which the whole of the clothing and other articles used in it are washed, dried, and ironed, in an incredibly short space of time. We have lately been afforded an opportunity of witnessing this useful piece of mechanism in operation, on which occasion no less than 1235 articles of wearing apparel, bed clothing, &c. were washed, dried and ironed, in two days, with the assistance of only eight women, and two girls from the school. It is the invention of James Wapshare, Esq., of Bath, for which we understand he has obtained a patent, and was some time since erected in one of the wings of the building solely devoted to the purposes of a laundry, at the expense of the chairman of the Board, the Rev. N. Dodson. The apparatus consists of a small steam boiler, with two pipes for the conveyance of steam. By the one pipe the steam is conducted to the coppers used for boiling the clothes, and supplying the washers with hot water; by the other the steam is carried to a closet in which the linen is to be dried. The exterior of this closet is a wooden frame covered with zinc; within, it is fitted up with pipes, increasing in number according to the extent of drying power required. These pipes are arranged horizontally one above another, resembling a turn-pike gate; excepting that the rails are connected at one end only by a bend or turn, thus forming a continued duct for the steam. The steam is admitted at the upper pipe, and passes its condensed water at the lowest. On either side of this tier of pipes is a moveable clothes-horse, which is drawn out to be hung with clothes. Upon the construction of these horses the operation of drying in a great measure depends. They are made close at the top of the box, so that no heat may *escape over* them, and the clothes are so disposed on them as to form an entire sheet, completely enclosing the pipes, and preventing any escape of the heat radiating from the pipes, except by passing through the clothes to be dried. This disposition of the clothes is easily accomplished, but difficult of description. On the outside of the horses, or on that side which is not next the pipes, a valve or opening is made on the top of the box, and a current of air being admitted at the bottom, the steam from the clothes is carried off as fast as it is generated. One set of these pipes, with two horses, would be sufficient for any moderate family. In an establishment so extensive as an Union house more is required. In the closet erected are three ranges of pipes, and consequently six horses or

two to each range, having an air space, with its valve between each set of horses. Attached to the flue that surrounds the boiler is a small oven for heating the irons, so that the whole operation of the laundry, as far as heat is required, is simultaneously effected by one fire.

Oxford Herald.

Antiquity of Railways and Gas.—Railways were used in Northumberland in 1633, and Lord Keeper North mentions them in 1671 in his journey to this country. A Mr. Spedding, coal agent to Lord Lonsdale, at Whitehaven, in 1765, had the gas from his Lordship's coal pits conveyed by pipes into his office for the purpose of lighting it; and proposed to the magistrates of Whitehaven to convey the gas by pipes through the streets to light the town, which they refused. Carlisle Journal.

Railway Speed.—The Railway Times states that, a few days back, an experiment was made on the Western Railway, in which the twenty eight miles was gone over at the rate of more than a hundred miles an hour.

M. Pambour has stated to the Academy of Sciences, that on the 3d of August last he had travelled with the Evening Star engine, taking with it only the tender and eight persons, at the rate of fifty-four and a half miles per hour, on the Great Western Railway; and that had the feeding pump been larger, he thought they might have gone still faster.

Mr. Brunel, it is reported, has succeeded in obtaining a railway speed equal to two hundred miles an hour!

A Locomotive Excavator.—M. Gervais, a manufacturer at Caen, has presented to the Academy of Sciences a model of a locomotive excavator. The inventor intends that the machine should be employed in the excavation of canals and formation of railways.

The railroad from Amsterdam to Haarlem was opened lately. It is the first road of the kind in Holland.

The first Railroad in Italy.—The railroad from Naples to Castellamare was opened on the 3d inst. by the King in person. Three Marquees were set up at Villa Carrione, near the station at Portici, at which the King, on alighting with the Royal family, was received by the Minister of the Interior, a commissioner appointed by the French shareholders of the company, a Neapolitan commissioner, and the chief engineer. The French commissioner, M. Dubois, made a suitable address to his Majesty, to which the King replied in the most gracious manner, taking occasion to say, "I experience great satisfaction at seeing Frenchmen uniting their interests with Neapolitans in this fine undertaking. The railroad will assuredly be of great benefit to commerce and industry. I have given my entire protection to this the first

essay of the kind in Italy; and being convinced of its utility to my people, I contemplate on the termination of your works as far as Nocera and Castella, a continuance of the communication by Avellino to the Adriatic. It will give me pleasure to enter into an association with the French." At a signal from the Fort of Grenatello a train started from Naples for Portici, the waggons being filled with soldiers and sailors, waving flags, and bands of music playing national and popular airs. The religious part of the ceremony followed. Monseigneur Giusti, in his pontifical robes, recited appropriate prayers, and pronounced his benediction on the undertaking. Another train, with the Royal and Court carriages, came up, and the King and Royal family, accompanied by the Minister of the Interior, the Commissioners, and other authorities, proceeded in them to Portici, where his Majesty and the Royal family with the Minister and Commissioners alighted, the rest of the party remaining in the carriages. Having minutely examined the locomotive engines and other parts of the establishment, his Majesty and the Court returned by the ordinary road to Naples. The railroad was in the afternoon given up to the public. The King has created M. Dubois, the French Commissioner, and M. Bayard, the chief engineer, Knights of the Order of Merit of Francis the First, a distinction the more honorable as there are only one hundred members of this order.

Railway Traveling.—The extraordinary developement of the inclination for railway traveling (observes the *Railway Times*) in proportion as this means of conveyance is extended through different parts of the country, may be inferred from the following summary of the passenger traffic on various lines of railway recently opened:

	Days.	Passengers.
Great Western, from July 1 to Dec. 31, 1838, ..	181....	220,018
" " " Jan. 1 to June 30, 1839, ..	181....	258,854
" " " July 1 to Aug. 25, 1839, ..	56....	132,918
London and Birmingham, Jan. 1 to June 30, 1839, ..	181....	267,527

Grand Junction receipts.............	1837.	1838.	1839.
Week ending July 8, ...	£3324 ..	£6615 ..	£9,235
" " " 15, ...	4910 ..	6602 ..	9,013
" " " 22, ...	5452 ..	7119 ..	9.748
" " " 29, ...	4673 ..	6617 ..	9,691
" " Aug. 5, ...	4187 ..	7143 ..	10,019
	£22,546	£34,096	£47,706

Birmingham Railway.—The journey of 112½ miles is now performed in five hours, stoppages included. London Paper.

Traveling Times.—The rate of traveling on the London and Birmingham and Grand Junction Railway lines has recently exhibited a very considerable acceleration. The London morning mail train to Liverpool and this town, completed its journey from station to station, we believe, in less than nine hours. From Birmingham to Stafford, twenty-nine miles, the ground was gone over in fifty-five minutes; to

Warrington seventy-seven and three quarter miles, in two hours and forty-three minutes; and the journey from Birmingham to Manchester, ninety-seven and a quarter miles, was performed, notwithstanding a stoppage of ten minutes at Warrington, and a short stoppage also at Park Side, in three hours and forty-six minutes. Manchester Guardian.

Tendency of Railways to create Traffic.—The Dundee and Newtyle Railway is about ten and a half miles in length; and previous to its opening, in 1832, the number of passengers accustomed to traverse the same route was estimated at 4,000 per annum. For two or three years the line was worked by horse power, but even then the number of passengers averaged 30,000 per annum. When locomotive engines were brought into use, that number was greatly increased, till now, the *monthly* average is very nearly five thousand; being at the rate of sixty thousand passengers per annum, or a *fifteen fold* increase on the number previous to the construction of the railway.

Railway Times.

The tendency of railways to create traffic is strongly shown in the case of some of the Northern lines. For example, the Arbroath and Forfar Company are carrying from two hundred to three hundred passengers a day, parallel to a line of road which never did, and never could support a single horse coach.

Misconception on Railways.—It is a singular fact in the early history of locomotive carriages, that their projectors assumed the existence of a difficulty which is known to be wholly imaginary; and, like the ancient Romans in the conveyance of water, without a knowledge that it would rise to its level, they resorted to sundry laborious contrivances for overcoming an obstacle that had no existence, and which nature herself, had she been asked, would have accomplished for them. They assumed that the adhesion of the smooth wheels of the carriage upon the equally smooth iron rail must necessarily be so slight that, if it should be attempted to drag any considerable weight, the wheels might indeed be driven round, but that the carriages would fail to advance because of the continued slipping of the wheels. The remedies devised for this fancied counteraction were various. One was conceived so valuable that a patent was taken out for it in 1811, by Mr. Blenkinsop. It consisted, as the writer well remembers, of a rack placed on the outer side of the rail, into which a tooth wheel worked, and thus secured the progressive motion of the carriage. It was, however, wholly useless—it was an impediment; the simple adhesion of the wheels with the surface of the rails upon which they are moved being by an immutable law amply sufficient to secure the advance, not only of a heavy carriage, but of an enormous load dragged after it.

Wade's British India.

Race between a Deer and a Steam Engine.—While the cars were coming down on Wednesday, a fine buck made his appearance on the track, and had a trial of speed with the locomotive. He kept the track for two miles, when he was finally run off, or he would have

been run over. The sight must have been deeply exciting and highly interesting; as the line of road is perfectly straight, every inch of the contest was witnessed by the passengers. Washington N. C. Gazette.

The Simplon road surpassed.—M. Volta, who has obtained the privilege of making a railway from Milan to Como, is now negociating with the Swiss Cantons of the Grisons and St. Gall, for making a tunnel through the Grisons Alps, and a railway through the two Cantons, to join that of Como. On condition of receiving an exclusive privilege of enjoyment for one hundred years, he engages to complete the work in thirty years from the commencement.

The south eastern railway. Shakspere Tunnel.—This tunnel, with its lofty gothic arches of thirty feet high, begins to shadow forth its ultimate effect. The passage through, our readers are aware, has long been completed; but as this excavation is principally that stratum of the chalk called by Philips "the chalk of abundant organic remains," which possesses the property of being at the same time of great hardness, and in small detached masses, wanting cohesion, the progress has not hitherto been so rapid; and in many places, more brick arching has been used than was at first contemplated. The work is beautiful in its execution, and of great durability. Passing through this tunnel, we come upon a vast platform, which forms the termination of Shakspere tunnel, and the commencement of that of Abbott's cliff. This latter is longer than the former, but as the chalk is much freer in its working, and more cohesive, some alterations will be permitted in the size and height of its tunnel, so as to admit of its being more expeditiously worked. The shafts, driftways, and galleries of this tunnel, are complete. Beyond this, one comes upon the wall, now in a state of forwardness; this wall is formed from a concrete of the grey chalk, or Halling lime, and the beach of the seashore. Its base is about thirty feet in thickness, and decreases upwards; and the top of the wall will be about twenty feet above high water mark; that part of it approaching to completion is very hard, and appears of great durability. From this wall, a gallery leads to Little Switzerland, or the Warren; and through the Warren the railway is conducted to Martello Tower No. 1. The earth cuttings in this part are proceeding very rapidly, there being nearly four hundred men employed in a short space. At Tower No. 1, the road tunnels and continues to Beachborough Hill in a straight line, passing over the junction of the Dover and Canterbury roads in its progress; the bridge for this viaduct is commenced. Of the farther continuation of the line we know but little more than that we hear every thing is going on successfully. The present pressure upon the money market has, doubtless, much influenced the price of these securities, in common with others; but it must be some consolation to distant shareholders to learn that, though the value in the market has receded, the expectations and confidence of the local proprietors have risen more than cent. per cent. during the last few months, convinced, as they appear to be, that the natural difficulties which have opposed themselves hitherto, are disappearing rapidly before the well directed energy and perseverance of the conductors. Dover Chronicle.

COL. PASLEY'S OPERATIONS AGAINST THE WRECK OF THE ROYAL GEORGE, AT SPITHEAD.

The great cylinder containing about one ton of gunpowder, which was let down on the 23d October, and which did not explode when the action of the galvanic battery was applied to its priming, had become, somehow, entangled amongst the wreck, and could not be extricated. The hawser which was attached to it being broken, and the downhaul rope having got foul of the ship's timbers, it was necessary to investigate matters by means of the "helmet divers,"and as these men could work only at slack water, a period which at spring tides is extremely short, many successive days were employed in this difficult research. At length on the morning of the 30th the cylinder was got at, and a hook rope being attached to one of its rings, the monstrous charge was drawn to the surface, when the whole of the powder was found to be saturated, with water. The cause of this accident has not yet been ascertained, nor can it be till the cylinder is completely dismantled and inspected by Col. Pasley, whose official duties have called him away to Chatham; and we shall, therefore, content ourselves at present with mentioning the fact. We may observe, however, that in every great operation of this kind, where almost all the circumstances are either new in themselves, or new in their application, failures of this sort are always to be expected; and that were an officer, from any fear of not succeeding at once, to hesitate in trying bold and energetic experiments, the service entrusted to him might remain for ever unperformed. It is the province of genius to conceive, and of talents and experience to execute, measures of 'pith and moment' from which minor minds might shrink. But in the execution of their task, as they have not the presumption to suppose themselves infallible, so they readily avail themselves of the fresh instruction which every failure, if rightly observed, is sure to impart. And we have no doubt that Col. Pasley with his wonted sagacity and perseverance, will derive from the accident alluded to, more expeditious, and even more economical methods of accomplishing the purpose entrusted to him by the Government, than if all had gone smoothly from the first. And here it may not be amiss to state what is the purpose of these operations. The *Royal George* was overset and went to the bottom on the 29th August, 1782, and she has been allowed to lie there during no less a period than 57 years—much to the disgrace, we must say, of the engineering science of this country—for the place where this enormous wreck has so long lain, is the most centrical, and in other respects, one of the best parts of Spithead. During the war, when large fleets of line-of-battle ships and great convoys of traders, filled up the anchorage, the blank space which encircled the buoy of the *Royal George*, and which it was dangerous to approach without risk of loss both of cables and anchors—was often greatly lamented. Things are changed now, and should the *Blenheim* or *Pique*—which God forbid!—go down to day at Spithead, we have no doubt whatever that in less than a fortnight Mr. Sadler, the able Master Attendant of the Dock yard, would raise her, and place her in safety in the basin.

In the case of the *Royal George* this is impossible, and the plan seems to be to blow her to pieces by a succession of great and small charges, and then raise the fragments by means of ropes attached to to them by help of the diving bell Many technical difficulties occur in this process, in placing and fixing the vessels properly, in sounding over the wreck, in warping and securing the lighters containing the charges, and finally in adjusting the boats and ladders, by which the helmet divers descend, or from which the diving bell is lowered. In arranging and conducting the details of these complicated manipulations, Col. Pasley, we are glad to see, has the advantage of Mr. Sadler's experience; and we are sure that his abilities, his cheerfulness, and his habits of resource, cannot fail to prove of the greatest use. The engineering details, on the other hand, are under the immediate management of captain Williams, of the Royal Engineers, and of Mr. Symonds, also of that corps, son of the Surveyor of the Navy. These officers, with a party of sappers and miners, live on board the *Success*, a frigate in ordinary, which, with no small consideration and foresight, had been moved out to Spithead, for the accommodation of the various parties employed on this service. Boats, officers, and seamen are also furnished by H. M. S. *Pique*, Captain Boxer, to assist in the many laborious processes connected with these operations.

On Thursday last, the 29th August, being the anniversary of the day on which

> "Brave Kempenfelt went down
> With twice four hundred men,"

Col. Pasley made an effort not to let the old ship be any longer in peace, and on this occasion he succeeded so completely that, if ever we had held the slightest doubt of his being able to accomplish the object in view, our apprehensions on this score must have been removed. Five successive charges were sunk and exploded on the wreck, and, so far as can be ascertained, with the most destructive effect. These charges, however, were comparatively small, the largest containing only 180 pounds of powder, the other four being of 45 pounds each. They were all fired by means of Bickford's fuses, an ingenious device, by which a match is made to burn for two minutes under the water, before the fire reaches the charge, which then explodes.

The method of setting off these charges may interest our readers. A weight, say a pig of ballast, or for economy, a heavy bag of sand or shingle, is lowered till it reaches the wreck, by means of a small slip rope, rove through an iron ring, both ends of the rope being kept on board the boat. To one end of the rope the vessel containing the charge is then made fast, and the other being well manned, the match is lighted, the vessel plunged into the water, and the rope briskly hauled in, so that long before the fuse is burned out, the charge is close down to the ring, and the boat removed at a safe distance.

The first, or largest explosion, on the 29th, produced a double shock sufficient to shake one of the largest of the dock-yard lighters or lumps from end to end, and to produce a sensation to those who were on board her, resembling a smart shock of electricity or galvanism. The interval between the shocks was very short, say the tenth of a second. The sound was sharper and louder than we had

expected, of a quick, angry, character. The effect on most persons was remarkable, but not the same on all Several ladies who were present felt severely shaken in the back, many imagined they were thrown up an inch or two off the deck, and one person had a headache instantly after feeling the shock.

The water over the explosions was not in the smallest degree affected so far as could be observed, for four or five seconds, when a boiling motion became apparent, and an evident rise in the water over a circular area of ten or twelve yards, accompanied by the most violent ebullition. Some go so far as to say the water rose four or five feet over the great explosion; we dare not say that it much exceeded a foot, or a foot and a half. Be this as it may, no smoke was seen, and at first only a prodigious evolution of air or gas, and a violent commotion on the water. In the course of a few seconds a cloud of mud, of a dark blue color, rose to the surface, accompanied by a disagreeable smell, caused either by the inflamed gunpowder or by the fœtid mud collected over the wreck. Several large fish were killed by the first explosion, but none by any of the others; at least none rose to the surface.

What change Col. Pasley may make in his operations when he comes to examine the unexploded cylinder, now recovered from the wreck, we cannot pretend even to guess. That he will not be baffled, is all we are certain of; and as he has given out that an explosion on the great scale will be attempted on Tuesday next, the 3d, we are nearly as certain, that he will not disappoint the public. The time will be either at 11 A. M. or 5 P. M. but probably the former, as that suits best for the neap tides; and it is said the Lords of the Admiralty are to be present on the occasion.

Twelve tin packets of preserved French beans, in a wooden box have been brought up from the Royal George, stamped "Conserve Artichena de Catron, Marseilles." Neither vinegar nor pickle had been used; they had been boiled and placed in air tight vessels, and were as fresh and fit for use as when first enclosed. They have been 57 years under water. Kentish Observer.

A new Conservative Power. The conservative power of mud has also been most curiously exemplified in the case of vegetable fibre, by a portion of a cable lately brought up from the wreck of the Royal George. A piece of a cable twenty-three inches in circumference, and about eight feet long, was recovered, and being unlaid and the yarns taken out, they were found to be so good that a short piece of one of them bore a weight of 193lb. and broke only with a weight of 195lb. The following experiment was then tried: a piece of rope, measuring two inches and a half in circumference, was made out of the yarns from one of the strands taken from the junk of the Royal George, and marked No. 1; another, also of two inches and a half, and twenty thread yarn, spun and tarred in 1838, was made No. 2; and a third of the same dimensions and number of yarns, spun and tarred according to the old method, in 1830, No. 3. These three ropes were then exposed to the usual test of strength by weights in the dock yard, when, to the great astonishment of every one, the following were the results:

	cwt.	q.	lb.
No. 1. Made from old junk saved from the Royal George, after being fifty-seven years under the mud, broke with a weight of........................	21	3	7
No. 2. Spun and tarred in 1838........................	23	1	7
No. 3. Spun and tarred in 1830........................	20	1	7

We have great satisfaction in communicating that the proceedings of this distinguished and persevering officer are daily becoming more important in proportion as his experience affords to his skill and ingenuity fresh means of overcoming the difficulties in his way. On Monday last a huge mass of the larboard counter was got up, and about twenty-four feet of the foremast, the lower part of which, including the step, was quite perfect. On Tuesday, the 15th, another of Col. Pasley's immense charges, consisting of 2400 pounds of powder, was fired by the voltaic battery. The effect was to blow the fore part of the ship so completely in, that on the next day one side of the bows, including two of the hawse-holes, was fished up, and in the afternoon of the same day the other side of the bow, with two other hawse-holes, was drawn to the surface. Numerous beams and a huge knee, called the breast hook, were also got up. The figure head, as may be supposed, has been anxiously looked for, but in vain Our readers are already aware from other sources that six iron thirty-two pounders and five brass guns have been recovered, together with much copper sheathing, the value of which already nearly equals the expense of the operation. The real value of the operation, however, consists in the important advantage it will confer on the principal naval anchorage; and Col. Pasley, we think deserves the thanks of naval men, as well as of the country, for his bold conception and able execution of this formidable enterprise. Our correspondent at Portsmouth mentions that the mass of water forced up by the last great explosion was not more than fifteen feet, or about one half of the height to which it was driven on the first occasion. Times.

The Royal George.—On the 30th October, a gentleman of the name of Vansittart descended to the spot where the Royal George is now lying. He describes the wreck to be enveloped in entire darkness, and to be completely imbedded in mud. This account fully corroborates the statements of the divers; and it is to be hoped that some means may be suggested by which light may be diffused below. It is true that Mr. Vansittart descended when the waves on the surface of the sea were undulating to a height of 30 or 40 feet, and it could not, therefore, be expected that he would see much under such circumstances. But the divers assert, that even on the brightest days of summer, when the sea is perfectly calm, they can scarcely see an inch before them. Lanterns have been tried but to no purpose. A vast expense would be saved, not only as respects the Royal George, but also with reference in future wrecks, if some means could be devised for introducing the light required.

The Royal George.—Col. Pasley has concluded his operations against the Royal George for this season. It is intended to recom-

mence operations about May next. There have been consumed during these experiments 12,940lbs. of powder. Above 100 tons of the wreck have been recovered and placed in the dock yard at Portsmouth, with five brass and six iron guns. It may not, perhaps, be generally known that the total expense incurred has been more than defrayed by the value of the articles recovered. Kentish Times.

NATURAL HISTORY.

Antiquity of the Pyramids.—M. Caviglia gave me an account, when I was in Cairo, of a singular discovery he had made, in the vicinity of the Pyramids, of a number of apartments and passages communicating with each other, and of his having seen, at a distance of many miles in the desert, the foundations of decayed pyramids, whose granite blocks were dissolved to dust: whence he argues, that if those now standing, composed chiefly of sand-stones, be four or five thousand years old, the antiquity of those others must be four times as great. Prince Puckler Muskau.

Climate of South Australia.—South Australia is situate on the southern coast of the great continental island of New Holland, and lies between the 25th and 39th degrees of south lat. and 132d and the 141st degrees of east long. It contains an area of about 300,000 square miles, or 192,000,000 acres, and it possesses, in a greater degree than any other portion of Australia, the important advantage of water communication; being indented by the great inland seas, denominated Spencer's and St. Vincent's Gulfs, and being traversed by the only considerable river, capable of inland navigation, hitherto discovered in New Holland. The province presents a sea coast of 1,300 miles. Port Adelaide, on which the capital is situated, is a perfectly secure harbor for vessels not exceeding 500 tons. Nepean Bay, in Kangaroo Island, is a more spacious harbor, capable of receiving shipping of the largest class; and Port Lincoln, on the western promontory, forming Spencer's Gulf, is one of the finest harbors in the world. Lake Alexandria is an extensive sheet of fresh water, forty miles in length, and thirty-five miles in breadth. The Murray and its tributaries, when cleared of the obstructions occasioned by the fallen timber, will be navigable by boats for upwards of 1,000 miles. The climate of South Australia is one of the most salubrious in the world. Fevers, and agues, so prevalent in the United States, and in the British settlements of North America, are here unknown. Exploring parties sleep upon the ground, in the open air, without hazard to their health. The weather is much warmer than in England, and the changes in the thermometer are sometimes sudden and considerable; but, from the prevalence of the sea breezes, and from the extensive purity of the atmosphere, the high temperature, as shown by the thermometer, is not felt to be more oppressive than summer heat in this country. As compared with England, the climate is very dry; but, as compared with the eastern coast of New Holland, it may be said to be moist; for, open to the southern winds, which are the prevalent winds in that quarter of the world, South Australia is not ex-

posed to the long-continued droughts which occasionally visit the colony of New South Wales. Dnring the last year, the drought in New South Wales was so great that, in many places, the flocks were dying for want of water; while this severe visitation did not extend to the moister climate of South Australia. Pamphlet of Col. Torrens.

Pigeons.—We are not aware whether pigeon fanciers have ascertained the average duration of life of this bird, when old age is permitted to terminate its existence; but however this may be, we are in a situation to enlighten the curious on this matter. James Garside of Birkenshaw, has now in his possession a male bird of this species, which he purchased sixteen years ago, and which was at the time upwards of two years of age, so that the bird is now in its nineteenth year. About two years ago it began to manifest signs of physical decay; the female with which it was mated ceased to lay any eggs, and latterly its sight has failed to such a degree that it was with difficulty it could steer its ærial flights, and its owner has very considerately placed it in a large wicker cage. Inverness Courier.

The Bezoar.—Lately, in the parish of Tarbolton, a concretion was taken from the stomach of a sheep after it was killed. It is nearly the size of the hand, spherical in shape, and in color and substance like corn dust. It is supposed that wool, conveyed with the milk into the stomach of the animal, when young, forms the nucleus. Such concretions were at one time famous as an antidote to similar productions in the human system, and were designated, by way of eminence, Bezoars. But the increasing influx of knowledge, is fast putting to flight the numerous family of charms, and mankind have long since refused to test the powers of the Bezoar.—*Correspondent.* The Bezoar, or Bezoard, no doubt belonged to the "family of charms," and was not only considered efficacious, as our correspondent observes, in dissolving similar concretions in the human system, but believed to possess high alexipharmic qualities, or, in other words, the power of counteracting poison. The light of science, however, refuses to attribute to the Bezoar other virtues than those "common to the saline particles of which it is composed, and which can be procured to greater advantage from other sources." The term Bezoar, is supposed to be from the Persian *pazahar*, an antidote or destroyer of poison. The stones were chiefly obtained from Asia and South America—the gazelle and goat in the former, and the pard and chamois in the latter, yielding them in greatest abundance. They were sometimes, though less frequently, found in the wild-boar, horse, rhinoceros, elephant, and other animals. The Persian stone was esteemed of the highest value, and called, *par excellence, bezoar orientale.* In size it was seldom larger than a kidney bean, of a round or rather oblong form, smooth in surface, and of a dark green color. The common Bezoar is often found in the stomach of goats. The one described by our correspondent is the largest we have heard of. Ayr Observer.

Equivocal Generation.—Zoological Society.—At the ordinary scientific meeting, on Tuesday evening, F. Wishaw, Esq. in the chair, the

first communication read was a letter from Mr. Mackay, of the British consulate at Maracaibo, on a plant called Projojoy in the country from which it is derived, and which attains the condition of a plant from the strange metamorphose of an insect. In the insect which was described some of the legs have already changed into roots, and in this state it was presented to the contributor. It was announced that a similar insect had lately been discovered in North Carolina. When the creature assumes the form of an insect or animal, it is about an inch in length, and much resembles a wasp in appearance. When the insect has attained its full length, it disappears under the surface of the ground and dies, soon after which, the two fore-legs begin to sprout and vegetate, the shoots extending upwards, and the plants in a short time reaching a height of six inches. The branches and the leaves are like trefoil, and at the extremities of the former there are buds which contain neither leaves nor flowers, but an insect, which as it grows falls to the ground, or remains on its parent plant, feeding on the leaves till the plant is exhausted, when the insect returns to the earth, and the plant roots forth again.

Earthquakes.—The latest arrivals from the Mediterranean state that Vesuvius is inwardly convulsed, and thick clouds of smoke cover the mountain top, the vapor of which is so very prejudicial to the vines in the immediate neighborhood, that the Government has remitted the taxes of the growers. It is a remarkable fact that the eruptions of Vesuvius have, almost in every case, been preceded by alarming indications of the volcanic action in Perthshire. About a month ago, it will be recollected, that some smart shocks were felt at Crieff and Comrie. It now turns out that, almost immediately afterwards, Vesuvius became convulsed. It thus appears that there must be a chain of strata, of uniform sympathy, stretching from the Grampian and Ochill Hills to Italy. There is nothing in the history of Scotland to show that earthquakes were peculiar to Perthshire, previous to the great earthquake at Lisbon; but, since that time, they have been more or less common; and on the assumption that a chain of electrical strata does exist in this direction, the conclusion might be drawn that, 'the foundations of the earth,' so to speak, were then 'rent;' and thus, according to Daubeney's hypothesis, 'water and atmospheric air' would thereafter find comparatively easy access 'through the channels in the rocks,' and reaching the heat which is believed to 'exist below a given point of the earth's surface,' produce the volcanic action. From the borings which have been made in Perthshire, in search of coal, the strata have been proved to be highly charged with electricity, more especially in the valley of Strathearn; and it has also been demonstrated that the heat there is not far from the earth's surface. Loch Earne, too, never freezes—a phenomenon exclusively applicable to that lake, as compared with others of equal dimensions in Scotland. Taking all these circumstances into account, we think they open up a very interesting and inviting field for the further investigation of physical science in connection with volcanic phenomena, and we hope the attention of scientific gentlemen will be early directed to the subject. Aberdeen Journal.

Spots on the Sun.—The *Gazette du Midi* gives an account of a discovery by Count Decuppis, the Italian astronomer. He is said to have succeeded in manufacturing glasses which enable the observer to look at the sun without having his observations at all affected by its rays. By means of those glasses the sun appears of a pure whiteness, and the surrounding firmament is equally distinct. M. Decuppis is stated to have observed on the 3d instant an unusual number of spots on the sun's disc, and having made an addition to his apparatus, he perceived at a quarter before nine, on that day, a small black spot, entirely free from penumbra, and of perfectly spherical form, which had advanced upon the disc, describing an arc of about seven minutes. Reiterated observations convinced him that it had, in the mean time, advanced towards the sun's limb, to the extent of two minutes and thirty seconds. At three minutes after nine, when M. Decuppis attempted to make a new observation, the spot had disappeared. The perfectly round figure of the spot, its blackness, the smallness of its diameter, its motion, and the absence of penumbra, appeared to the observer to be so many proofs that it was a small planet, hitherto undiscovered, which was passing over the sun's disc. Galignani's Messenger.

The Owl at Sea.—The ship *Margaret*, which arrived at this port on Friday last, from Quebec, has brought home a prisoner of rather extraordinary description. This is a fine owl, which was captured at sea, not less than 500 miles from any land. Whither the solitary bird was voyaging is not known. Liverpool Mercury.

Colored Salt.—There are hills of colored salt near Darabgird, white, black, green, yellow, and red. This salt the people fashion into trays, and whatever else they wish, and send them into distant regions. In all other countries salt is produced from the bosom of the earth, or from the concretion of water, but here it appears in the form of entire mountains. The plain, which is twelve miles from Darab, appears glittering with particles of salt, which was more abundant in each handful I gathered from our path than sand or earth.

Sir W. Ouseley's Travels in Persia.

Geographical Discovery.—Mr. Schomburgck, the enterprising traveller in British Guiana, where he has been employed for the last four years as an agent of the Royal Geographical Society, and at the expense of their funds, aided by a grant from government, has just returned to England, after an absence of nearly twelve years. Following in the steps of Dr. Hancock, Mr. Hillhouse, and others, he twice ascended the river Essequibo, which he explored to its sources, about 40 miles north of the equator, and then examined the Berbice and Corentyn rivers. During his last journey, in which he was absent for two years, in the interior, he crossed the boundary to Fort San Josquim, in the Brazils, and by a westerly course, traveled to Esmeralda, on the Orinoco, thereby connecting his labors with those of Baron Humboldt in 1800, and materially changing the position of the sources of that river, as laid down in all our maps. From thence he again ascended the Rio

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Branco, to San Josquim, completing a circle of upwards of 2,000 miles, a great part of which was through a country previously unknown. Mr. Schomburgck's communications have often formed matters of interest at the meetings of the Geographical Society, and he has brought over with him to this country, a valuable herbarium, and a large collection of rare specimens of natural history, the produce of a country almost unknown to Europeans. He is also accompanied by three Indians of different tribes, from the interior; and has brought specimens of their arms, implements and utensils. Accounts have also been received from Mr. Gould, who has left Van Dieman's Land for Southern Australia, having already collected about 800 specimens of birds, and 70 quadrupeds, with many other objects of interest in natural history.

Discovery of a Canoe.—About two months ago, while some drainers were employed at Loughley Loch, in the parish of Tarbolton, they came upon a canoe, buried eight feet below the surface of the earth. This interesting naval relic, of ancient days, is about sixteen feet in length, and three in breadth, and is formed after the most approved Indian fashion. It is constructed of the hardy mountain oak, is perfect in all its parts, and in a state of comparatively good preservation.

Kilmarnock Journal.

Discovery of a Subterranean Chamber at Alton.—A number of laborers have lately been employed, by the Earl of Shrewsbury, in excavating part of the ruins of the ancient baronial castle, which forms the chief ornament of this picturesque village. Amongst other trifling curiosities they found some bullets, and a piece of ancient coin; but a few days since they discovered a subterraneous apartment and a flight of stone steps, which apparently form a descent to the bottom part of the stupendous and lofty rock on which the castle is built. The excavation has since been suspended by order of the earl, who intends to continue it to a still greater extent on his return to England next summer.

Staffordshire Examiner

The Barometer.—It is a singular fact, that since Thursday last the mercury has stood here, almost constantly, at the height of 30½ inches, which is marked *set fair* on some Barometers; and yet we have had rain every day, and often in heavy showers. Is it possible that this phenomenon has any connexion with the earthquake? Scotsman.

The late Earthquake.—The most remarkable effect of the shock in Edinburgh, and which was not at the moment observed, is the detaching of some blocks of freestone from a stratum which was laid bare by the formation of a castle road, on the south of the Esplanade, and which now lie across the footpath. Two of these blocks are of considerable size, and will weigh, at least, ten tons. Caledonian Mercury.

Paper was first manufactured in England, by John Spilman, or Spielman, a German, in the reign of Elizabeth, who granted him the subordinate manor of Portbridge, or Byckmore, in Dartford, Kent, which had previously been an appendage to the priory. Here on the site of a wheat and a malt mill, he built a paper-mill for the making of writing paper; and in the thirty-first of Elizabeth, who knighted him, and to whom he was Chancellor, he obtained a license for the sole gathering, for ten years, of all rags, &c., necessary for the making of such paper. He died in 1607, at the age of fifty-five; his effigy, and that of his lady, are in the chancel on the north side of Dartford church.

Mirror.

☞We have just received a valuable communication from the Hon. DANIEL WEBSTER, and sincerely regret, that it has come too late for insertion in the present number. It will certainly appear in our next.

LIST OF PATENTS,

Granted for Scotland subsequent to 22d November, 1839.

To Alexander Borland, of Paisley, accountant, a machine for measuring water and other liquids, and regulating the quantity thereof. Sealed 26th October.

James Smith, of Deanston Works, Perthshire, cotton spinner, for certain improvements applicable to canal navigation. Sealed 26th October.

George Chapman, of Whitby, engineer, for certain improvements in steam engines. Sealed 26th October.

Samuel Wilkes, of Darlston, Staffordshire, iron founder, for improvements in boxes and pins, or screws for vices and presses. Sealed 28th October.

Thomas Nicholas Raper, of Blackfriars, London, for improvements in rendering fabrics and leather water-proof. Sealed 28th October.

Robert Edward Morrice, of King William street, London, (communicated by a foreigner residing abroad,) for improvements in the manufacture of boots and shoes, and covering for the legs. Sealed 26th October.

James Smith, of Deanston Works, Perthshire, cotton spinner, for a self-acting temple, applicable to looms for weaving fabrics, whether moved by hand or power. Sealed 1st November

James Yates, of Effingham Works, Rotherham, iron founder, for certain improvements in the construction of cupola or blast furnaces for melting metals, which improvements are also applicable to furnaces or fire-places for other purposes. Sealed 1st November.

John Barnett Humphreys, of Southampton, civil engineer, for certain improvements in shipping generally, and in steam vessels, in particular, some of these improvements, being individually novel, and some the result of novel applications or combination of parts already known. Sealed 1st November.

John George Bodmer, of Manchester, civil engineer, for certain improvements in machinery or apparatus for cutting, planing, turning, drilling, and rolling metals, and other substances. Sealed 8th Nov.

William Newton, of the Office for Patents, Chancery-lane, London, civil engineer, for certain improvements in machinery or apparatus, for making or manufacturing screws. Sealed 11th November.

James Sutcliffe, of Henry street, Limerick, builder, for certain improvements in machinery or apparatns for raising and forcing water or other fluids, and increasing the power of water upon water wheels and other machinery. Sealed 11th November.

James Ulric Vaucher, of Mount-street, Grosvenor-square, for certain improvements in fire engines and other hydraulic machines and apparatus, for raising or propelling water and other fluids, some of which improvements are also applicable to steam engines. Sealed 11th November.

Moses Pool, of Lincoln's-inn, (communicated by a foreigner residing abroad,) for improvements in apparatus applicable to steam boilers, in order to render them more safe. Sealed 11th November.

James Craig, of Newbattle paper mills, county of Edinburgh, for an improvement or improvements in the machinery for the manufacturing of paper. Sealed 12th November.

Pierre Auguste Ducotè, of 70 Saint Martins Lane, London, for certain improvements in printing china, porcelain, earthenware, and other like wares, and for printing on paper, calicoes, silks, woollens, oil cloths, leather, and other fabrics, and for an improved material to be used in printing. Sealed 14th November.

John Dickenson, of Nash mill, county of Hertford, paper maker, for certain improvements in the manufacture of paper. Sealed 18th November.

George Hanson, of Huddersfield, plumber, &c. for certain improvements in the construction of cocks or taps for drawing off liquids. Sealed 19th November.

Frederick Clark, of Chelsea, for improvements in building ships, steam vessels, and boats, and also in the building of canal and river barges and lighters. Sealed 22d November.

Charles Andrew Caldwell, of Audley-square, London (communicated by a foreigner residing abroad,) for improvements in furnaces and apparatus for applying the heat of fuel.

William Wiseman, of George-yard, Lombard st. London, communicated by a foreigner residing abroad,) for improvements in the manufacture of alum.

New Patents sealed in England, 1839.

To Stephen George Dordoy, of Blackman street, Borough, chemist, for certain improvements in the manufacture of gelatine, size, and glue. Sealed 31st October—6 months for inrolment.

To David Greenwood of Liverpool, millwright, and William Pickering, of Liverpool, merchant, for improvements in engines for obtaining power. Sealed 2d November—six months for inrolment.

To Samuel Morand, of Manchester, merchant, for improvements in machinery for stretching fabrics. Sealed 2d November—six months for inrolment.

To Theobald Wahl, of George-yard, Lombard street, engineer, for improvements in boilers, applicable to locomotive and other engines. Sealed 2d November—6 months for inrolment.

To Alexander Angus Croll, of Greenwich, manufacturing chemist, for improvements in the manufacture of gas, and in reconverting the salts used in purifying gas, and improvements in the manufacture of ammoniacal salts Sealed 2d November—6 months inrolment.

To John Cutten, of Margate, coal merchant, for improvements in garden pots. Sealed 2d November—6 months for inrolment.

To William Hannis Taylor, of New-York, but now of Bridge street, Blackfriars, Esq. for improvements in obtaining power by means of electro-magnetism. Sealed 2d November—6 months for inrolment.

To Frederic Augustus Glover, of Charlton, near Dover, clerk, for an improved instrument for the measurement of angles. Sealed 2d November—6 months for inrolment.

To Henry Venner Cocks, of Birmingham, iron founder, for certain improvements in stoves and furnaces. Sealed 2d November—6 months for inrolment.

To Henry Crosley, of Hooper square, Leman street, civil engineer, for an improved batterie, or arrangement of apparatus for the manufacture of sugar. Sealed 7th November—4 months for inrolment.

To James Murdoch, of Great Cambridge street, Hackney road, mechanical draftsman, for certain improvements in marine steam engines. Sealed 7th November—6 months for inrolment.

To Thomas Yates, of Bolton-le-moors, manufacturer, for certain improvements in the construction of looms for weaving, and also the application of the same in order to produce certain descriptions of goods or fabrics by steam or other power. Sealed 7th November —6 months inrolment.

To George Hanson, of Huddersfield, plumber and glazier, for certain improvements in the construction of cocks or taps for drawing off fluids. Sealed 7th November—6 months for inrolment.

To Thomas Whiteley and John Whiteley, of Stappleford, near Nottingham, lace makers, for improvements in warp machinery. Sealed 7th November—6 months for inrolment.

To John Thomas Laurente Lamy Godard, of Christopher street, Finsbury square, merchant, for improvements in looms for weaving, to be worked by steam or other power, being a communication. Sealed 7th November—6 months for inrolment.

To John Jones, of Westfield place, Sheffield, for an improved table knife. Sealed 7th November—6 months for inrolment.

To Edmund Moody, of Maiden Bradley, Wilts, yeoman, for improvements in machinery for preparing turnips, carrots, parsnips, potatoes, and all other bulbous roots, as food for animals. Sealed 7th November—6 months for inrolment.

To Thoms Edmondson, of Manchester, clerk, for certain improvements in printing presses. Sealed 9th November—6 months for inrolment.

To James White, of Lambeth, engineer, for improvements in machinery for moulding clay to the form of bricks and tiles, and also for mixing, compounding, and moulding other substances. Sealed 12th November—6 months for inrolment.

To William Chesterman, of Burford, Oxford, engineer, for improvements in stoves. Sealed 12th November—6 months for inrolment.

To Moses Poole, of Lincoln's inn, gentleman, for improvements in making nails, bolts, and spikes, being a communication. Sealed 12th November—six months for inrolment.

To Moses Poole, of Lincoln's inn, gentleman, for improvements in looms for weaving, being a communication. Sealed 12th of November—6 months for inrolment.

To William Wisemann, of George yard, Lombard street, merchant, for improvements in the manufacture of alum, being a communication. Sealed 16th November.

To John Burn Smith, of Salford, Manchester, cotton spinner, for certain improvements in machinery for preparing, roving, spinning, and twisting cotton, and other fibrous substances. Sealed 16th November—6 months for inrolment.

To Miles Berry, of the Office for Patents, Chancery lane, patent agent, for an invention or discovery by which certain textile or fibrous plants are rendered applicable to making paper, and spinning into yarns, and weaving into cloth, in place of flax, hemp, cotton, and other fibrous materials commonly used for such purposes, being a communication Sealed 19th November—6 months for inrolment.

To Francis Worrell Stevens, of Chigwell, Essex, schoolmaster, for certain improvements in apparatus for propelling boats and other vessels on water. Sealed 19th November—6 months for inrolment.

To John Parsons of the Stag Tavern, Fulham, victualler, for improvements in preventing and curing smoky chimneys. Sealed 21st November—6 months for inrolment.

To Robert Hawthorn and William Hawthorn, of Newcastle-upon-Tyne, civil engineers, for certain improvements in locomotive and other steam engines, in respect of the boilers and the conveying of steam therefrom to the cylinders. Sealed 21st November—6 months for inrolment.

To John Faram, of Middlewich, Chester, gentleman, for certain improvements in the mode of constructing, applying, and using railway switches, for connecting different lines of railway, or two distinct railways, and for passing locomotive steam and other engines, and railway carriages and waggons from the one to the other of such railways, and for certain apparatus connected therewith. Sealed 21st November—6 months for inrolment.

To Pierre Auguste Ducote, of Saint Martin's lane, for certain improvements in printing china, porcelain, earthen ware, and other like wares, and for printing on paper, calicoes, silks, woollen, oil-cloths, leather and other fabrics, and for an improved material to be used in printing. Sealed 21st November—6 months for inrolment.

To William Daubney Holmes, of Lambeth square, Surrey, civil engineer, for certain improvements in the construction of iron ships, boats, and other vessels, and also in means for preventing the same from foundering; also in the application of the same improvements, or parts thereof, to other vessels. Sealed 23d November—6 months for inrolment.

To John Hunt, of Greenwich, engineer, for an improved method of propelling and steering vessels. Sealed 23d November—6 months for inrolment.

To Richard Hornsby, of Spittlegate, Lincoln, agricultural machine maker, for an improved machine for drilling land, and sowing grain and seeds of different descriptions, either with or without bone or other manure. Sealed 25th November—6 months for inrolment.

To John Sutton, of John street, Lambeth, machinist, for improvements in obtaining power. Sealed 25th November—6 months for inrolment.

To James Craig, of Newbattle paper mill, Edinburgh, for an improvement or improvements in the machinery for manufacturing paper. Sealed 25th November—6 months for inrolment.

To Arthur Collen, of Stoke-by-Nayland, Suffolk, plumber, for improvements in pumps. Sealed 25th November—6 months for inrolment.

To James Matley, of Manchester, gentleman, for improvements in apparatus or instruments for the cutting of cotton or the wicks of lamps, being a communication. Sealed 25th November—6 months for inrolment.

To George Rennie, of Holland street, Blackfriars, civil engineer, for certain improved methods of propelling vessels. Sealed 25th November—6 months for inrolment. Newton's London Repertory.

LIST OF AMERICAN PATENTS,

Granted from January 15th to February 12th, 1840.

(CONTINUED.)

John H. Stevens, Assignee of C. E. Warner, New-York, making Druggists' and other Boxes. Patented January 15th, 1840.

Dudley D. Sacket, Westfield, Massachusetts, improvement in the Braiding Machine. Patented January 22d, 1840.

Theophilus Somerby, Wells, Maine, making Wrought Drawn Nails. Patented January 22d, 1840.

F. H. Southworth, St. Louis, Missouri, Tide and Current Water Wheel. Patented January 22d, 1840.

George H. Crosley, New Haven, Ohio, construction of Chimneys to prevent smoking. Patented January 28th, 1840.

Young W. Short, Oglethorpe County, Georgia, Grubbing Machine. Patented January 28th, 1840.

Elisha W. Welsh, Paris, Virginia, improvement in Grist Mills. Patented January 28th, 1840.

Mahlon Smith, Tinicum, Pennsylvania, improvement in the Plough Patented January 28th, 1840.

William and James Thorn, Plainfield, New Jersey, apparatus attached to the Locomotives, for removing obstructions from the tracks.—Patented January 29th, 1840.

Julius Willard, Baltimore, Maryland, machine for making Bricks. Patented January 29th, 1840.

James Baldwin, Nashua, N. H. Shuttle for Weaving Cloth. Patented January 31st, 1840.

Edwin Moody & Samuel Morrill, of Andover, Merrimac County, New Hampshire, Self Tending Saw Mill. Patented February 8th, 1840.

David Vance Rannells, of Washington, Mason Co. Kentucky, machine for Sawing Stone in square, round, or other shaped blocks. Patented February 8th, 1840.

Robert M. Smith, Rutherford, Tennessee, mode of dressing Mill Stones. Patented February 8th, 1840.

L. Bush, Assignee of *Isaac Lowell*, Pendleton, N. Y. apparatus for preventing and checking the ravages of Fire upon buildings. Patented February 12th, 1840.

☞ From the great press of other important matter we are compelled to defer giving specifications of the American patents in this number. The list however will be found complete. Should it prove necessary an extra sheet will be occasionally added for specifications.